# ELECTRICAL REVIEW

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## IN THIS ISSUE

Power for Defence .. .. .. .. .. .. 457
Control in Generating Stations.—3. *By W. Szwander, Dipl. Ing. (Warsaw), A.M.I.Mech.E., M.I.E.E.* .. .. 459
Micro-wave Television Link .. .. .. .. .. 465
Views on the News .. .. .. .. .. .. 466
Personal and Social .. .. .. .. .. .. 467
E.I.B.A. Activities .. .. .. .. .. .. 469
Correspondence .. .. .. .. .. .. .. 470
Submarine Telephone Cables .. .. .. .. .. 471
New Books .. .. .. .. .. .. .. 472
A.P.L.E. Conference .. .. .. .. .. .. 473
1,000 W Mercury Lamp .. .. .. .. .. 475
Radio Progress. *By W. E. Miller, M.A.(Cantab), M.Brit.I.R.E.* 476
Commerce and Industry .. .. .. .. .. 479
The Fannich Project .. .. .. .. .. .. 483
Financial Section .. .. .. .. .. .. 486
Electricity Supply .. .. .. .. .. .. 489
Recent Introductions .. .. .. .. .. .. 491
New Patents .. .. .. .. .. .. .. 493
Contract Information .. .. .. .. .. .. 495

Classified Advertisements .. .. .. .. .. 73
Index to Advertisers .. .. .. .. .. .. 88

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ELECTRICAL REVIEW

Vol. CXLVII No. 3800 22ND SEPTEMBER, 1950

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# Power for Defence

## DANGERS OF FURTHER DELAY

INDUSTRY generally, and the electrical industry in particular, is anxious to know exactly what impact the rearmament programme will have upon the quantity and nature of production, a subject on which too little was said in last week's defence debate in the House of Commons.

In his speech opening the debate on the Government's proposals, the Prime Minister said: "It is clear that the main weight of the additional production we are proposing to undertake must fall on the industries making capital goods, such as machinery, vehicles, ships, aircraft and electrical goods." In this context, of course, the term "electrical goods" does not mean what it usually does, but electrical machinery and other heavy plant. Later he made a reference to the reduction in the provision of radio and television sets.

### What Interpretation?

Did Mr. Attlee mean that the electrical industry will have to increase its ordinary production of power generating equipment to meet a possible greater demand for electricity or was he suggesting that the industry would have to divert its attention to the production of warlike equipment?

It is sincerely to be hoped that the first interpretation is the correct one. The Government should have learned by this time that a shortage of electric power endangers industrial production, but it is as well to make sure that the possibilities are fully realized.

### Little Enlightenment

Mr. Gaitskell's speech on the following day provided little enlightenment on this point. In his earlier remarks Mr. Gaitskell said that electricity shortages should not interfere with the rise of output "programmed" but it was more than ever necessary that domestic consumers should keep off the peak. In view of the existing power position this was very optimistic and hardly supported by his later observation that "in many cases—electricity, gas, transport—we still have to catch up on wartime arrears and it would be the height of folly to plan for a big increase in our military equipment while ignoring as war potential an efficient and modern transport system and an adequate level of generating capacity."

We need not stress again how inadequate that level is, and will remain unless something more is done. At the least we need an annual increment of 1,500 MW a year; last year only 825 MW was actually commissioned. A more realistic figure is 2,000 MW if we are to meet the increasing demand of home industry and defence as well as preserving our export markets.

The electrical plant manufacturers, under pressure from the Government, have so increased their productive capacity that they are capable of meeting all immediate and future demands. Indeed

unless they are given orders by the British Electricity Authority they will have to find further overseas outlets for their products if they are to keep going.

The B.E.A. fully realizes its duty and is anxious to proceed faster with its expansion programme. Yet in the background is the mistaken idea of the Government and its advisers that capital expenditure on power plant must conform to the pattern set out in the White Paper on the general subject of capital expenditure. There seems to be inadequate appreciation of the fact that electricity is the most important tool of all industries. Without an adequate and uninterrupted supply no modern industry can carry on. And only by an increased use of electricity can the volume of production per head be increased to the extent necessary to avoid the inflation which arises from too great a gap between demand and supply.

Power station construction now in progress must be pressed on at a greater rate and at the same time immediate provision must be made for additional stations to meet future requirements to the full instead of partially, which is all the present programme seems likely to do.

## AMERICAN PLANS

The Americans appear to have a better appreciation of the importance of electric power to the rearmament programme. The United States Department of the Interior is considering a "two-way" expansion of its power programme "in the interests of national security." An investigation is being made of the possibility of speeding up projects now under way and of building new stations as a contribution to defence measures.

## SHOT-FIRING

The making of new roads underground in coal mines is a laborious and costly business. It would be much more so if simultaneous multi-point shot-firing, which is permitted with safeguards, could no longer be practised. The risk of misfires, which can subsequently cause dangerous accidents, cannot be removed altogether, but it should be reduced by improving the design of exploders used in collieries, which is the purpose of Safety in Mines Research Paper No. 107 to which brief reference is made on another page. One recommendation that merits general endorsement is that shot-firers ought to have some means, an ohmmeter, for instance, of determining when the resistance of a round of shots is so high that it would be unwise to attempt to fire it. No exploder can be made to cover the whole range of possible circuit variations, for no matter how low may be the resistance of individual connecting leads, the total value will depend upon the care with which they are jointed together in completing the series circuit as a whole.

## SCOTTISH POWER

The linking of the water intake tunnel to the Grudie Bridge power station with Loch Fannich is notable for two reasons. First, the blow-through the bed of the loch was done in a way (described on another page) which is rarely attempted because of the danger involved. The method was used once before—also in Scotland and by the same contractors—twenty years ago. Secondly, the output of this station is expected to be completely absorbed during this winter. So great are Scottish demands for electricity becoming that the North of Scotland Hydro-electric Board is now spending at the rate of £2.5 million a year on distribution alone.

## ACCELERATORS

The several forms of device named particle accelerators which were described at the B.A. meetings in Birmingham—incidentally, are they machines or instruments?—are proving themselves to be powerful tools for nuclear physicists who are seeking to know, not so much how atomic nuclei are built, as more about the electric forces that govern the motion which keeps the system together. Valuable as has been the information obtained in this way, the use of appreciably greater energy (a 1,000 MeV project is already being worked upon in America) is bound to reveal fresh phenomena of which there is at present no indication. It is this possibility that is the most exciting aspect of research into the fundamental laws of nature.

# Control in Generating Stations

## *3—Basic Principles of Modern Designs*

By W. SZWANDER, Dipl. Ing. (Warsaw), A.M.I.Mech.E., M.I.E.E.*

THE two previous articles of this series† showed how the co-ordination of control of the various flows is indispensable to the satisfactory functioning of a generating station. In the least advanced stage such co-ordination is achieved through the purposeful action of the operators responsible for various controls, making use of indications of the values of electrical frequency, steam pressure, quantity of coal in the bunkers, or of ash in the hoppers, etc.

Any improvement of co-ordination of controls leads towards their centralization, or their automatic operation, or to both. Centralization ensures co-ordination through control of several interdependent services from one place and by one operator, who at all times has good insight into the actual results of his control activities; thus the boiler operator has under his control the flows of media linked in the boiler (fuel, ash, air, flue-gases, water, steam). Automatic operation eliminates the human factor, ensuring (in theory) perfect co-ordination through continuous and direct measurement of two or more interdependent values and by adjusting their relative values accordingly.

### Ideal System

An ultimate step would be a completely centralized and fully automatic system of control which, without intervention of the human element, at any time would produce in a satisfactory and economic manner the amount of power demanded at the delivery point by the connected distribution system. Some such degree of perfection has almost been achieved in hydro-generating stations, but in steam-operated stations it can hardly ever materialize, mainly because of the complications involved in starting and shutting-down the plant, but also because of its susceptibility to damage by the smallest departure from specified conditions and the necessity for continuous human supervision to ensure high efficiency of operation. There is no doubt, however, that in thermal generating stations the centralization and automatization of controls, which is justified, is continuously increasing in degree.

### Technical and Economic Aspects

One is confronted with the usual conflict between technical and economic aspects: before a step forward in the direction of centralization or automatization can be made any advantages to be achieved must in each case outbalance the cost of both the installation and the maintenance of the respective new equipment. Progress is slowed down considerably by the necessity for, in most cases, some operating personnel capable of taking charge during the starting and the shutting-down periods, and also to be available at times of failure of any centralized or automatic controls. With the increasing importance of power generation, however, and installations becoming more complicated and costly, the justifiable degree of centralization and of automatic control has also an upward trend because of the possible gains in the efficiency and safety of plant operation and the resulting easing of duties of the operating personnel.

The present review is not intended to advocate or condemn any particular development. The author feels, however, that it would be as great a mistake to oppose modern centralized or automatic control as it would be to attempt to make use of too many automatic controls. To

* Chief Technical Assistant, Belfast Corporation Electricity Department.

† Parts 1 and 2 appeared in the *Electrical Review* of 11th and 25th August.

give a true picture of the present stage of development the following can be said. Speed-control of turbines and boiler water level control (or feed-water intake) are nowadays without exception performed automatically. Voltage and steam-superheat control are also automatic in the large majority of newly built installations. It is in respect of frequency (and/or power flow) and of boiler control (of steam-pressure constancy, or steam-flow) that opinions differ at present to the greatest extent. In any case, large numbers of installations are most successfully using automatic control for these two purposes and there is no doubt that with time both will practically always be automatic. In the meantime caution in

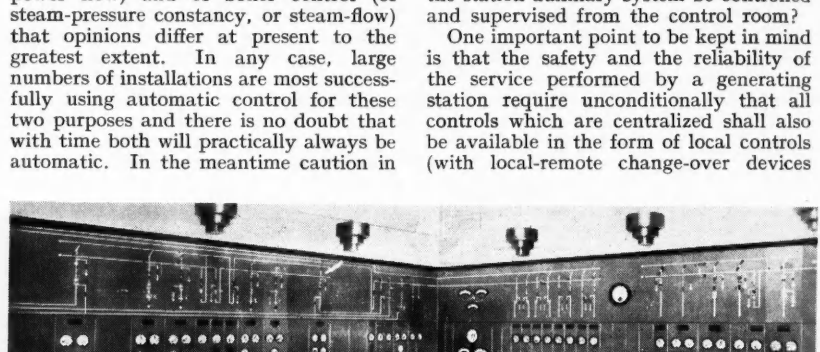


**Fig. 12.—Generating station control room (Metropolitan Vickers Electrical Co., Ltd.)**

judgment is necessary and each case must be investigated on its own merits.

Centralization may apply either to controls of one flow (in coal or ash-handling installations) or it may mean bringing together controls of various services. Both cases lead to considerable saving in labour, both expedite the quality of control and the second type helps also to maintain the required co-ordination. Cost and complication are the restraining factors. On the whole, progress in control centralization in recently built stations has been great. Even so, the degree of centralization which can be justifiable or is actually adopted in respect of various individual components varies widely. For example, a practice long since established is to have the controls of electrical switchgear centralized in a station control room (Fig. 12). Whether the isolating switches should also be remotely controlled, or only remotely indicated, remains a matter of opinion. Similarly, to what degree should the station auxiliary system be controlled and supervised from the control room?

One important point to be kept in mind is that the safety and the reliability of the service performed by a generating station require unconditionally that all controls which are centralized shall also be available in the form of local controls (with local-remote change-over devices situated locally) and that all automatic controls shall be available in the form of manual controls as well. For the sake of convenience of manual operation in most cases facilities for centralized (remote) manual operation must be provided with the indispensable alternative of emergency or stand-by local operation.

It is impossible to place too much emphasis on the necessity for keeping the staff required for taking care of the maintenance of complicated automatic and centralized control installations; or on the need to have a general operating staff properly qualified to run the station on manual control in the event of the

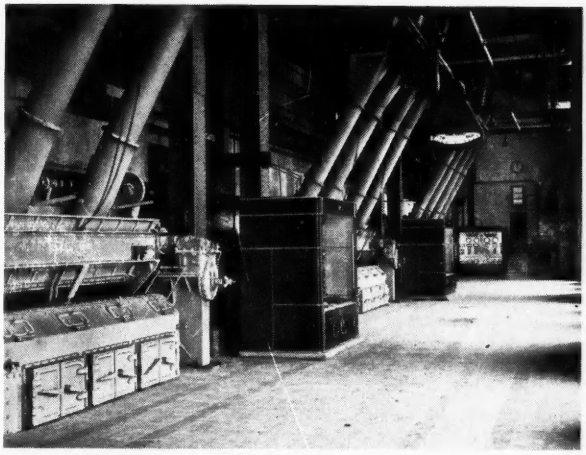


**Fig. 13.—Modern boiler control boards beside 150,000 lb/hr stoker-fired boilers, the instrumentation including equipment for automatic boiler control**

automatic devices being out of service. Automatic and centralized control should not be regarded as replacing the highly skilled staff; they are provided only to assist and relieve the staff and thus to improve on the kind of service obtainable from the human element.

Development of station control has been and is a continuous process. Broadly speaking, three typical classes can be distinguished, in most cases depending on the age of the stations.

(a) The orthodox arrangement is found in the large majority of stations, though great differences in details must be admitted. The main characteristics are: the electrical central control room (Figs. 1, 3, 7, 12) for control of the main switchgear and of the electrical output (power, voltage, frequency) of the turbo-generators. In more up-to-date instances the general auxiliary power distribution is supervised, or also controlled, from the control room. Supervision and control of the turbo-sets and of their associated auxiliary services is carried out by operatives stationed near the sets. Turbine gauge boards (Figs. 2, 9) carry a large number, but by no means all, of the instruments and controls involved. Separate control points are usually provided for the generator field regulating equipment and for the cooling fan drives, boiler feed pumps, operation of steam valves, etc. The turbo-set is linked with the control room by direct control of the governor speed-gear and by some form of signalling or telegraph.

Boilers have more or less elaborate boiler panels (Figs. 6, 10, 13 on which controls for various auxiliaries are centralized to a greater or lesser degree. Automatic boiler control equipment,

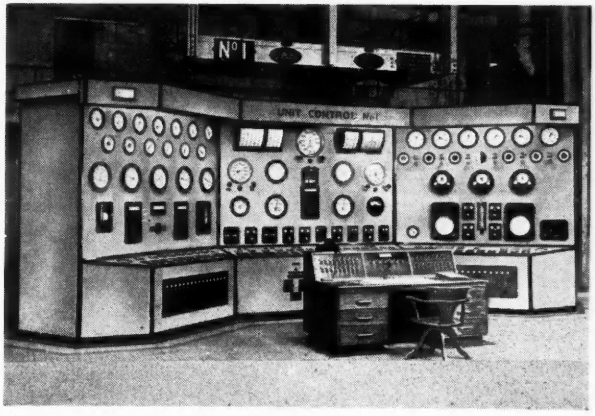



**Fig. 14.—"Unit" control board in a modern British generating station, controlling one boiler and one turbo-generator (Bailey Meters & Controls)**

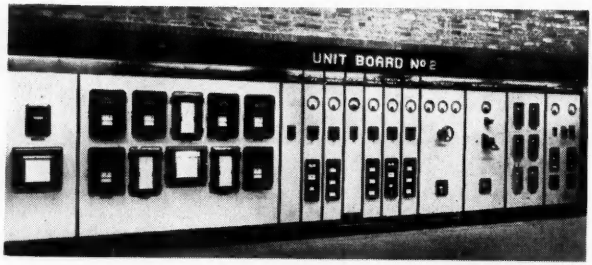



**Fig. 15.—"Unit" board controlling auxiliary switchgear of one boiler-turbine unit, comprising also recorders, generator field controls, etc. (Bailey Meters & Controls, Ltd.)**

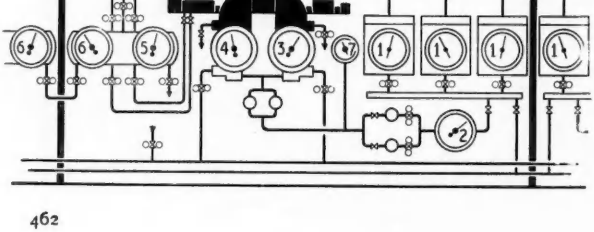
when provided, constitutes the final step in individual boiler control centralization and in most cases also, with an operation to maintain the steam range constancy, it represents a form of boiler-group control. Control of auxiliary motors is either electrical, remote, operated from boiler and turbine gauge boards; or for some motors of lesser importance, manual, effected by starters beside the motors. Circulating water, coal handling, ash plant, etc., have their own control points situated conveniently.

The main disadvantage of the described arrangement is that at times of quickly varying loads, or in emergencies, the control room operators have no direct knowledge of the conditions in the boiler house. Further, continuous supervision of efficiency is laborious because it involves reading data from many boiler and turbine gauge boards. This type of installation possesses, however, a very high degree of service reliability.

(b) The modern "unit"-type arrangement is similar to that described in the preceding section, but has features which ensure closer co-ordination between the controls of one turbine and the boiler (or boilers) constituting one "unit." This may be achieved at first simply by elimination of the dividing wall between the turbine and the boilers so that direct communication of their operatives is facilitated. The next step is the erection of the turbine and boiler control panels as one assembly (Fig. 14), the whole heat cycle being supervised and controlled from one point. This scheme, incidentally, sometimes causes difficulty in respect of the demands it puts on the operatives, which differ largely from those satisfied in the past by two classes (turbine drivers and boiler firemen), but this is not insuperable.

Physical subdivision and even separation of all equipment (main and auxiliary) associated with each "unit" leads to the splitting of some controls previously grouped on the functional basis, associating them with the "unit" control boards. This applies to auxiliary power (Fig. 15) to circulating water, ash handling, etc. The tendency is at present very strong and is leading sometimes to rather complicated "unit" control boards on which controls for associated devices like the field circuit-breaker, field rheostats, c.w. pumps, generator fans, etc., are included. On the other hand, in some cases considerable simplification is possible. For instance, with a single row of boilers and no dividing wall all

**Fig. 16.—One "unit"-panel of a station performance indicator (in the central control room) for a "unit"-type installation with three boilers associated with each set: (1) steam-flow indicators for outputs of three boilers, (2) feed-water temperature indicator, (3) condenser vacuum indicator, (4) condensate temperature indicator, (5) steam pressure gauge (main receiver) with (6) steam temperature indicator (main receiver) and (7) surge tank level indicator**



auxiliary switchgear of a "unit" can be accommodated in the firing aisle so that remote control of distant motors can be dispensed with and replaced by manual starting. All that need to be retained are the indication of motor operation (ammeters or signal lamps) and the speed-controlling devices.

Steam and feed pipework being considerably simplified in "unit" arrangements, the respective valves are usually remotely operated from one central point. Automatic boiler control is an almost standard feature. The control room, controlling as before the power output of the "unit," is usually provided with indica-

a "station performance indicator" (Fig. 16) to show at one glance an overall picture of the operating conditions of the main components of the mechanical plant.

(c) An arrangement with centralized thermal controls is the most advanced stage and as yet, at least in this country, is still rather experimental. Examples in actual operation are few and differ widely in details. Interest in this arrangement, however, is considerable and the very idea appears to be so logical that it can safely be assumed that stations of the near future will more and more fall into this category. The principle is applicable to both the "unit" and "non-unit"

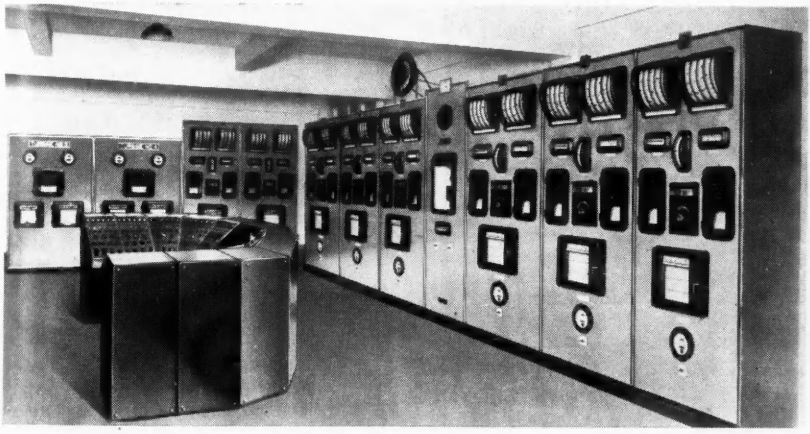


**Fig. 17.—Example of central thermal control room with panels for essential indicators and recorders and controls assembled on the semi-circular desk (George Kent, Ltd.)**

tions of steam pressure, number of coal mills in operation, etc. Supervision of thermal efficiency of each "unit" is comparatively simple. To eliminate from control boards everything not essential for actual operation, instruments are mounted separately, in some cases in one distant "recorder room" common to all "units." The continuous responsibility, however, for the efficiency of operation still remains the duty of the "unit" operator at his control board.

A step towards the next phase of development, that of centralizing the station thermal controls, but still without actually reaching that phase, is to provide in the central electrical control room

type, the purpose of centralizing being twofold: to increase the flexibility of plant output and of performance adaptation to the varying load conditions, and to improve the overall thermal efficiency through closer supervision. Even when controls are centralized, however, boilers and turbines cannot be left unattended because of the necessity for continuous direct supervision. Further, a number of controls, measurements and indications associated with turbines and boilers never could be transferred to a distant central control room with any degree of economic justification. Finally, most of the starting and shutting-down operations cannot be performed remotely; hence individual

boiler, turbine, or unit control boards are still required with full equipment for efficient local operation.

The object of central thermal control by additional boiler, turbine, or unit panels erected either in the main station control room, or else in a thermal control room adjoining it (Fig. 17), will be to provide means of efficient and speedy adjustment of outputs to the varying demand from the electrical system fed by the station. Only the minimum of instruments and controls required for the above purpose will be brought to the central control room. For each turbine: steam pressure gauges before the stop valve and after the governor valve, condenser vacuum gauge, governor speed gear control switch, c.w. pumps speed control devices (if any) and indication. For each boiler: stop valve steam pressure and temperature gauges, $CO_2$ indication, furnace pressure and i.d. fan suction gauges, controls with indication for devices regulating the draught plant and the fuel flow (stoker speed, or number of pulverizers running and air-flow through each of them, or coal-feeder speed). In the usual case of automatic boiler control, instead of the individual controls for fuel, air and flue-gas flows there will be means for adjusting fuel-air ratio and steam pressure.

Variations in the selection of instruments and controls may obviously be many. In each case, however, the basic assumption is that the local plant attendant is responsible for the starting and the shutting-down of a turbine, or a boiler, or every individual pulverizer. He is also responsible for the safety of the unit and for its operation at the best efficiency, which he achieves by his local controls overriding the impulses sent out by the control room operator, who is responsible only for the loading of all plant in the way best suiting the system requirements. In doing this he will anticipate by increasing the steam pressure the periods of rising load and *vice versa*, to allow for the inherent thermal inertia of the plant.

In this way the speed of response to fluctuations of load is increased by eliminating the two consecutive factors —electrical frequency and steam pressure—the changes of which, resulting from load variations, are necessary in the orthodox arrangement for altering the plant output. The functional division of responsibilities between the control room operator and the local plant attendants is very clear and must help to better performance both in respect of keeping more even levels of frequency and steam pressure (control room's responsibility)

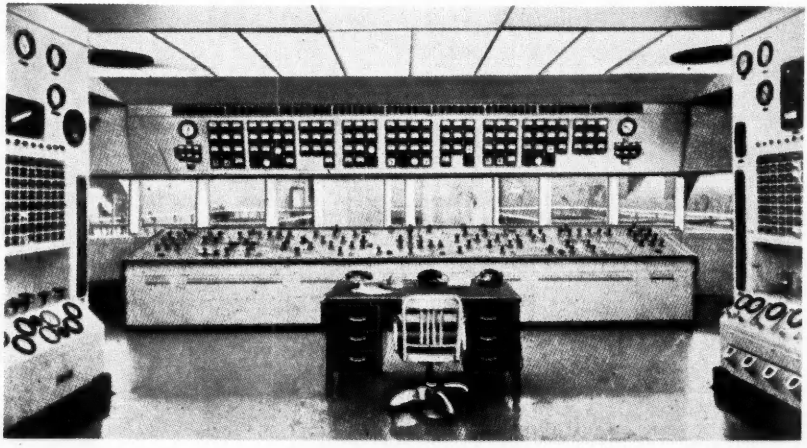


**Fig. 18—Example of station operating room in an American station with turbine and boiler control panels on two sides, electrical controls in front. Windows afford a clear view of the two turbines and two boilers which are controlled from this room**

and of obtaining better unit efficiency (local attendant's task).

Central panels for load control are preferably provided in the main station control room, or in one distinctive part of it, this room being inherently the station load control centre. Quite apart from this, a purely thermal control room may be additionally provided with the only object of facilitating supervision of the thermal efficiency. This room need not be adjacent to the main control room, but should be placed conveniently to simplify auxiliary piping and wiring. It should supplement the operation of the individual plant attendants, but not take their place. A nucleus of such a supervision room is the recorder room already provided in many stations.

The central thermal control room may also conveniently become the point for remote operation of all the valves between plant units (like the electrical control room for switchgear operation) so relieving individual gauge boards and centralizing responsibility for this important sphere. The degree of elaboration may be a matter of individual opinion. Installations are in existence with a complete luminous flow diagram of the whole thermal plant (steam, condensate, feed-water, drain circuits) with built-in instruments (flow-meters, thermometers, pressure gauges) and valve-operating switches. In modern installations in which extra-high efficiencies are achieved at a high capital expenditure, a certain additional expenditure on means to ensure the continuous maintenance of theoretical values is well justified.

American practice (Fig. 5) seems to favour a rather different approach to that described in the above. Instead of providing remote control panels for boilers and turbines near to, or inside, the electrical control room, the latter is in some cases transferred to a position between the turbines and boilers. It contains also the individual, or the unit-type, thermal control panels (Fig. 18) so that local panels become redundant, as the operators from the control room have easy and direct access to the items of the plant concerned.

This development is due to modern generating stations being dissociated from distribution systems, the number of output circuits actually controlled from the stations being comparatively very small.

## Micro-wave Television Link

FOLLOWING the recent extension of the B.B.C. television service to Sutton Coldfield and the plans made for service to Holme Moss, it is announced that a contract has been placed and work has begun on a micro-wave link which will extend television to Scotland. The G.P.O. specification covers a two-way television radio-relay system which will make it possible for programmes to be fed to the B.B.C. Scottish television station now under construction at Kirk o' Shotts, midway between Edinburgh and Glasgow, and will also give facilities for the relaying of items from Scotland throughout the whole television network.

This link, which will be the longest of its kind in Europe, is being designed and installed by Standard Telephones & Cables, Ltd., and will follow a route from Manchester northward on the east side of the Pennine Chain to Kirk o' Shotts, an overall distance of 245 miles. There will be unattended repeater stations spaced at about 30-mile intervals, to receive, amplify and re-transmit the signals over successive line-of-sight transmission paths. These will consist of main and reserve receivers and transmitters with four paraboloid aerial assemblies mounted on steel towers ranging in height from 28 to 200ft.

Special features to ensure uninterrupted service include reserve transmitters and receivers which will be automatically brought into operation on failure of any corresponding part of the equipment. As an additional safeguard a system of supervisory signals and alarms, with associated remote-control switchgear, will afford a complete picture of operating conditions throughout the system, and the means of switching-in equipment remotely from either of two control stations.

## Hydro Scheme and Scenery

MR. ALFRED ROBENS, Parliamentary Secretary to the Minister of Fuel and Power, visited the Tummel-Garry hydro-electric scheme on 5th Sept. Referring to the fears which had been expressed regarding the effects of the proposed development in the Snowdon area, which he recently visited, he said that at Pitlochry there was proof that the scenery was merely changed and not in any way destroyed.

# VIEWS on the NEWS

## By REFLECTOR

AS I have known the eminent people who are honoured in the naming of the British Electricity Authority's colliers, the passage of these ships up and down the Thames always awakes pleasant recollections. None will do more in this way than the latest addition to the fleet —the *Sir Archibald Page*—which was launched last week from Wm. Pickersgill & Sons' yard at Smethwick, Sunderland, by the late Sir Archibald's daughter, Mrs. A. Kerr. For forty years or more Sir Archibald's kindly presence graced hundreds of electrical gatherings and the national grid is a monument to his engineering and organizing ability.

★ ★ ★

Steps are being taken by the Midlands Division of the B.E.A. to prevent the recurrence of accidents to children caused by their kites making contact with high-voltage lines. It has been found that kites are being sold with bell wire as a stronger substitute for cord or string and the dangers of this are obvious. Education authorities are being asked to distribute printed warnings which the Division has produced. Copies should also be sent to shopkeepers who no doubt have overlooked the grave possibilities.

★ ★ ★

The confusion between the Divisions of the British Electricity Authority and the Electricity Boards is almost bound to persist. Recently it was complained at a meeting of the Southern Electricity Consultative Council that the Southern Board had had to pay £200,000 more than it should have done for electricity "imported" from the London Division. Because the coal charge in the Southern Area was greater than that in London the Board had to pay that much more for the imported electricity which members of the Consultative Council thought was a "swindle." One or two Press reports thereupon made it appear that the London Electricity Board had been guilty of sharp practice and it was necessary for the chairman of the Southern Consultative Council at a subsequent meeting to explain that it was the B.E.A. who reaped the benefit.

★ ★ ★

It looks as though the small total of English (I stress English) hydro-electric power is to be reduced, for it is reported that the Dee Bridge power station is being sold by the B.E.A. to the West Cheshire Water Board, which intends to erect a pumping station there. This small water-power undertaking (just over 600 kW) was constructed by the Chester Corporation Electricity Department in 1913 and in 1948-49 generated about 108,000 kWh.

★ ★ ★

Correspondence has appeared in the *Manchester Guardian* recalling the good old days before the horse-tram was ousted by electricity and the internal combustion engine. One writer, with a flair for the right phrase, stated: "My uncle was the secretary to the Manchester Horse Tramways. He passed away in full harness after a life's service for the company."

★ ★ ★

Inadequate illumination is lamentable in these days but it is almost justified when it gives rise to such outbursts as this in a local newspaper: "Gravesend's Parrock Farm estate is a dimly lit land of frightened and angry people. When the shades of night descend on the five isolated roads that form Parrock Farm, only six street lamps wage a watery war on the stygian darkness."

★ ★ ★

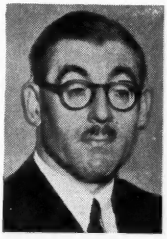
It is reported by the *Electrical World* that "when muddy road conditions made it impossible for a meter reader to reach his farm, a farmer took a picture of the meter dial and sent it to the Central Maine Power Co. for billing." Very ingenious; but I can't help wondering how the photograph got to the company if the road was impassable.

# PERSONAL and SOCIAL

## *News of Men and Women of the Industry*

ON 11th September **Mr. F. H. Schroeder,** D.I.C., B.Sc., M.I.Mech.E., M.I.E.E., sales director of Lancashire Dynamo & Crypto, Ltd., left by air to visit Turkey, Greece and the Near East, where he will see the company's agents to advise them on the latest products of the L.D.C. group of companies and put into force the necessary arrangements in connection with the expansion of the L.D.C. overseas trade. Mr. Schroeder will be away for two or three weeks, returning via certain European countries where he will make similar arrangements.

The appointment of **Mr. C. R. Dawson** as manager of the English Electric Co.'s Sales and Contracts Department, Diesel Engine Division, at Brownsover Hall, Rugby, is announced. Mr. Dawson, who is a member of the Incorporated Sales Managers' Association, received his early education at Pontefract and Stoke-on-Trent before gaining practical training with Twyfords, Ltd., Stoke-on-Trent. In 1927 he joined the staff of Ruston & Hornsby, Ltd., Lincoln, where, after varied experience in connection with war contracts, he was appointed contracts manager in 1944, and then home sales manager in 1945. He held that position until he took up his present appointment with the English Electric Co., Ltd.



**Mr. C. R. Dawson**

**Mr. D. J. Pearce,** A.M.I.E.E., has been appointed principal of Clydesdale College, Mossend, Lanark County Council's new centre for technical instruction. Mr. Pearce was senior assistant at Bolton Municipal Technical College. He graduated B.Sc. (electrical and mechanical engineering) at Bristol University and took his M.Sc. degree in electrical engineering there.

**Mr. J. H. Enion,** of Bedford, who has for many years been associated with the Igranic Electric Co., Ltd., and has been a director since 1940, has retired. In 1911 he joined the Adams Manufacturing Co., the predecessors of the present company, and has been mainly concerned with the sales side of the business. He has also for several years been a director of the holding company, Metal Industries, Ltd., and has been responsible for the electrical interests of this concern.

**Mr. H. A. R. Binney,** C.B., an Under Secretary of the Board of Trade, has been appointed Deputy Director of the British Standards Institution. Mr. Binney will be taking up his appointment next month.

We regret to hear that **Mr. J. Holland,** assistant chief engineer (traction) of British Insulated Callender's Cables, Ltd., is now undergoing treatment in the Warrington Royal Infirmary Private Nursing Home following upon a recent motoring accident.

**Mr. P. G. Brookes** has been appointed chairman of the Madras Electric Tramways (1904), Ltd., in place of **Mr. K. A. Scott Moncrieff,** who recently resigned.

Davey, Paxman & Co., Ltd., Colchester, announce that **Mr. J. P. Elliott,** F.C.I.S., F.A.C.C.A., A.C.W.A., secretary and chief accountant of the company, has been appointed to the board of directors.

**Mr. H. Simpson,** late of British Insulated Callender's Cables, Ltd., Stoke-on-Trent, has been appointed manager of the new Stoke-on-Trent branch of the Provincial Wholesale Co., Ltd.

**Mr. E. Carnegie** and **Mr. John L. Hardie** have been appointed directors of Metal Industries, Ltd.

James Howell & Co., Ltd., of Cardiff, announce the appointment of **Mr. K. Goodman** as buyer of their Radio and Electrical Departments. Mr. Goodman has been associated with the radio and electrical trade since 1934, his last position being buyer for Paul Taylor, Kettering. Previously he was with the Civil Service Stores, Strand, London.

**Mr. W. T. Bamford,** B.Sc.(Eng.), A.M.Inst.C.E., A.M.I.Mech.E., has been appointed group generation engineer (operation) with the No. 1 Group of the London Division, British Electricity Authority. After taking his degree at University College, Mr. Bamford served with the British Thomson-Houston Co., Ltd., as a student

apprentice. In 1925 he joined the London Power Co., Ltd., and following service at the Deptford and Battersea generating stations was chief assistant engineer at Acton Lane at vesting date, subsequently being appointed station superintendent at Fulham.

**Mr. H. Greenwood,** A.M.I.E.E., A.M.I.Mech.E., has been appointed power station superintendent at the new Agecroft station of the British Electricity Authority, North Western Division. He was educated at Barnsley High School and King Edward VII School, Sheffield, and continued his studies at the Manchester College of Technology, Salford Royal Technical College and Sheffield University. He served his apprenticeship with the Metropolitan-Vickers Electrical Co., Ltd. Mr. Greenwood, who takes up his new appointment on 1st October, is at present station superintendent at Wolverhampton (Midlands Division). He has served with the Yarmouth and Hull Electricity Departments, and from 1931 to 1939 was charge engineer at Padiham power station (L.E.P. Co.).

**Mr. A. Lockwood,** of Reading, has been appointed chairman of the Southern Electricity Consultative Council, in succession to Major Sir Herbert Young, who died in April last. Mr. Lockwood, who is closely connected with the Co-operative movement, was a member of the Reading Electricity Committee until nationalization.

**Mr. B. H. Binder** and **Sir Reginald Leeper** have been elected to the board of the Mexican Light & Power Co., Ltd.

Nearly eight hundred entries have been received from the employees of the **South Western Electricity Board** and the **B.E.A. South Western Division** for what promises to be one of the finest public exhibitions of arts and crafts ever staged in the South West. Prizes of National Savings Certificates totalling over £100 are being offered. Employees of every grade and from all parts of the Area will be showing examples of their sparetime handicraft. The exhibition, which is to be opened by Alderman J. G. R. Orchard, Mayor of Exeter, will be held at the Royal Albert Memorial Museum, Exeter, from 23rd to 26th September.

## OBITUARY

**Mr. C. H. Champion.**—The death occurred on 30th August of Mr. Charles Harold Champion, A.M.I.E.E., M.I.Mech.E., F.R.P.S., chairman of the Ship Carbon Company of Great Britain, Ltd. Mr. Champion was sixty-four.

**Mr. F. A. Crosse,** formerly manager of the Maxlume Lighting Section of Veritys, Ltd., London office, died on 6th September.

## WILLS

**Mr. A. P. MacAlister,** M.I.E.E., former borough electrical engineer of Islington, who died on 10th June last, left £10,494 gross (£10,408 net).

**Mr. E. Ll. Ingram,** M.I.E.E., a former chief engineer of the Bournemouth & Poole Electricity Supply Co., Ltd., who died on 13th June last, left £2,533 gross (£2,469 net).

**Mr. C. A. Newton,** late governing director of C. A. Newton & Co., Ltd., who died on 27th August, 1949, left £94,923 gross (£62,012 net).

**Mr. J. G. Statter,** M.Inst.C.E., M.I.E.E., chairman and joint managing director of J. G. Statter & Co., Ltd., who died on 28th February last, left £41,975 gross (£41,732 net).

**Mr. H. W. Broadbent,** M.Sc., M.I.Mech.E., F.I.I.A., principal of Enfield Technical College, who died on 20th March last, left £5,695 gross (£5,463 net).

## NEXT WEEK'S EVENTS

**Wednesday, 27th September**

LONDON.—London School of Hygiene and Tropical Medicine, Keppel Street, W.C.1, 6.30 p.m. British Institution of Radio Engineers. Annual general meeting, followed by the presidential address by P. Adorian.

LONDON.—Connaught Rooms, W.C.2, 12.30 for 12.55 p.m. Batti-Wallahs' Society. Luncheon. "The Second Congress of Europe," by Sir David Maxwell Fyfe.

**Thursday, 28th September**

BRADFORD.—Y.E.B. Offices, 45-53, Sunbridge Road, 7.30 p.m. I.E.S. Bradford Group. "Cold Cathode Lighting Equipment," by E. A. Langsdon.

LONDON.—85, Minories, E.C.3, 5.30 p.m. Institute of Marine Engineers. Presidential address by Sir A. Murray Stephen.

LONDON.—Connaught Rooms, W.C.2, 12.30 for 1 p.m. Public Transport Association. Annual luncheon.

LONDON.—Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6.15 p.m. The Engineers' Guild. Annual general meeting of the Metropolitan Branch.

**Friday, 29th September**

BIRMINGHAM.—Arden Hotel, New Street, 7 p.m. Society of Instrument Technology (Midland Section). "The Application of Automatic Controllers to Industrial Process Plant," by H. J. Smith.

HULL.—Y.E.B. Showrooms, Ferensway, 7.30 p.m. Hull Electronic Engineering Society. "Frequency Modulation," by E. D. Hart and A. G. Wray.

**Saturday, 30th September**

LEEDS.—B.E.A. Yorkshire Division offices, 1, Whitehall Road, 2.30 p.m. I.E.E. North Midland Students' Section. Chairman's address by Mr. Sykes.

# E.I.B.A. ACTIVITIES

## *Review of Past Year's Work*

THE annual report of the Council of the Electrical Industries Benevolent Association for 1949 shows that though the extended national insurance and health legislation has been a great help, it has in no way removed the need for social service work. The total amount paid out in grants, pensions and allowances in 1949 amounted to £29,711, as compared with £31,404 for 1948, and although there has been a gratifying increase of £6,519 in the voluntary income of the Association, the surplus of £2,733 does not make good the deficit of £4,005 for 1948. If the capital money spent in the year on Broome Park is taken into account, the outgoings have exceeded incomings by £1,399.

**Mr. E. C. Holroyde**

The number of applicants dealt with during the year totalled 455, compared with 398 in 1948, an increase of 14 per cent, and the number of entirely new cases was 174, compared with 148 in 1948, an increase of 18 per cent.

The structural adaptations to Broome Park are now complete and it has adequate capacity for twenty residents. Further on in the future there will be certain extensions, but the original programme has now been carried through. This has included the rewiring of the whole of the lighting circuits, the installation of adequate electric power points and additional lighting points. The report states that the experiment of running Broome Park on entirely non-institutional lines is succeeding.

### Further Increase Foreshadowed

The likely effects on the Association's work of the new defence programme were referred to by the president, Mr. E. C. Holroyde, when the annual meeting was held at the Institution of Electrical Engineers last Friday. He said that the programme would call for an expansion of their industry, and the increase in personnel would result in greater demands on the Association, but he was sure they would not be found wanting.

At the commencement of the meeting Mr. Holroyde spoke of the loss which the Association had suffered by the death of its immediate past-president, Mr. A. G. Beaver, who had taken an active part in their work since 1905.

Moving the adoption of the report and accounts, Mr. L. C. Sharp, chairman of the Court of Governors, said that there had been a decrease in grants in 1949, but this year, owing to the larger number of cases the figure would be substantially higher. The resolution was seconded by Mr. H. A. Deacon and carried, after Mr. V. Watlington had given an account of the work at Broome Park.

With the exception of two who did not seek re-election, the retiring members of the Council were appointed to serve for a further term, and the following were added: Messrs. H. Butterworth, H. J. Grant, M. M. Macqueen and V. M. Roberts.

At the subsequent Council meeting Mr. Holroyde was re-elected president, tribute to his work being paid by Mr. Sharp. Messrs. C. R. King and H. J. Randall were elected additional members of the Court of Governors, and at the Court meeting which followed Mr. Sharp was re-elected chairman. Mr. A. B. Wildsmith and Mr. F. E. C. Miller were elected additional committee members.

### Annual Ball

The annual ball and cabaret of the Association will be held on Friday, 10th November, at Grosvenor House, Park Lane, London, W.1. Applications for tickets (£2 2s each) and table reservations should be made to the Association at 32, Old Burlington Street, London, W.1. Members of the Electrical Wholesalers' Federation are asked to note that their requests for tickets should be sent to Mr. A. B. Wildsmith, as a bulk allocation has been made to cover all members of that Federation.

Among other events arranged for the autumn and winter are the following: 26th September, E.I.B.A. Golf Championship, Addington Park; 6th October, Birmingham carnival; 13th October, Cheltenham ball and Exeter ball; 17th October, Glasgow dinner dance; 20th October, Reading ball and Brighton ball; 24th November, first annual ball at Stoke-on-Trent; 1st December, Manchester ball. Further details of these functions can be obtained from the Association headquarters, 32, Old Burlington Street, London, W.1, or from the Branches concerned.

# CORRESPONDENCE

**Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents**

## Fan Drives

IN connection with the article by "Sash Bar" (1st Sept.), I should like to draw attention to a very convenient rearrangement of the author's formula for the temperature rise of the stator windings during the accelerating period :—

Initial assumptions are (1) no heat loss by conduction, etc., and (2) constant (equivalent) current I throughout the starting period.

Then power loss = $I^2R$ watts.

where I = equivalent phase current (A) and R = phase resistance (ohms).

Energy loss/min = $60I^2R$ joules.

$$\text{Heat loss/min} = \frac{60}{4.18} \cdot I^2R \text{ calories.}$$

$$\text{Therefore temp. rise} = \frac{60}{4.18} \cdot I^2R \cdot \frac{1}{453.6 \cdot w0.0936} \text{ deg C/min.}$$

where $w$ = stator copper weight in lb/phase.

$$\text{whence temp. rise} = 0.3375 \frac{I^2R}{W} \text{ deg C/min.}$$

But $w = (0.975 \cdot S^2R)$lb where

S = cross-sectional area of stator conductor in mm.$^2$

$$\text{Thus temp. rise} = \frac{0.3375 \cdot I^2R}{0.975 \cdot S^2R} = 0.35\left[\frac{I}{S}\right]^2$$

= 0.35 [current density $(A/mm^2)]^2$ deg C/min.

I have found this expression rather more convenient than that of the author, as it is based on a simple design constant, current density and does not require the introduction of the copper weight (in lb, incidentally this is not indicated in the article). Further, it can be applied equally well to a rotor winding of the squirrel-cage type ; an appropriate correction is necessary if the bar material is not h.c. copper.

The choice of the heating factor (taken as 0.87 by the author) is dependent on the shape of the current/time curve during the accelerating period ; examination of a number of such curves for fan and pump loads indicates an average factor of about 0.8 so that the author's figure certainly provides an ample factor of safety.

"DOUBLE CAGE."

*London.*

## Interconnection in Europe

WE thank you for your comments (18th August) on the article in which the viewpoint of our manager, Mr. Vittorio De Biasi, on the convenience of a European electrical super-grid, is summed up.

We are glad to note the interest that Mr. De Biasi's point of view has aroused, which is confirmed also by statements we have received from eminent personalities, among others Mr. Crescent, of Electricité et Gaz, Paris; Mr. Hamilton of the E.C.A. Mission in Austria ; Mr. Kuntschen of the "Federal Water Service" of Berne, Switzerland; and Mr. Antoine of Electricité de France. Mr. Antoine points out, particularly, that: "Cet article . . . fait ressortir d'une façon excellente l'intérêt qu'il y a à developper les relations à très haute tension entre pays et les échanges d'énergie correspondants, sans construire pour cela un grand super-reseau qui serait extrêmement coûteux."

Besides the views quoted above, Mr. E. Etienne, Berne, in a lecture on the "Bestrebungen für die Zusammenarbeit in der europäischen Elektrizitätswirtschaft," delivered in Zürich in May, 1950, arrived at conclusions perfectly in accord with the viewpoint expressed by Mr. De Biasi.

*Milan.* SOCIETA EDISON.

# Submarine Telephone Cables

## *Two New Netherlands—Denmark Routes*

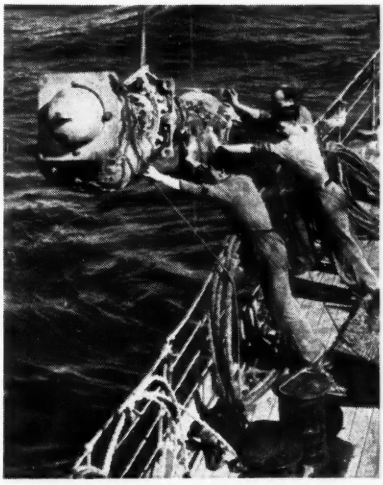
THE laying of two new high-speed submarine telephone cables between Oostmahorn (Holland) and Romo (Denmark) was completed on 4th September. In each cable two submerged repeaters were inserted. Most of the telephone communication between the Scandinavian countries and Western Europe will, it is anticipated, now go over these routes. The cables were made for the Netherlands and Danish Administrations by Submarine Cables, Ltd., at the Greenwich works of the Telegraph Construction & Maintenance Co., Ltd., and took some fifteen months to manufacture.

The specially designed composite conductor is insulated with "Telcothene" to a diameter of 0.935in. Over the core is a copper screen composed of six spirally applied tapes and these are lapped with a short lay copper tape, the whole forming the "return" conductor. This is served with tarred jute yarn to form a bedding for the armouring wire, which consists of 15 No. 2 gauge steel wires, with finally two servings of tarred ply jute yarn. The finished gauge is approximately 2in and the weight about 13 tons per nautical mile.

The landward ends are protected for some distance out by further insulation of "Telcothene" of radial thickness 0.1in. This enables any extraneous currents which may be induced in the outer conductor near the shore to be controlled and minimized and, as an added precaution against interference, a lead sheath is applied to the lengths in trenches.

The characteristics of the cable per nautical mile at 15 deg C are: Resistance (d.c. central conductor), 1.13 ohm; capacitance, 0.185 microfarad; insulation, d.c., $5 \times 10^6$ megohm; attenuation at 352 kc/s = 1.55 db.

The total length of each cable is 142 nautical miles, divided as follows: northern section, 62; central section, 40; southern section, 40. Each cable provides 36 telephone circuits, "go" and "return," in the Netherlands-Denmark direction within the frequency band 24 to 168 kc/s while in the reverse direction the frequency band is 208 to 352 kc/s. The total cable attentuation at 352 kc/s is 220 db, which is being divided into 96, 62 and 62 for the northern, central and southern sections respectively.



**Lowering the submarine telephone cable repeater over the ship's side to the sea bed**

The gap between the two frequency bands mentioned is used for supervisory and signalling circuits. In the low-frequency band below 24 kc/s an audio-frequency non-repeatered speaker circuit is provided. The power to operate the submerged repeater is obtained from the terminal apparatus at the shore ends of the cable and is fed over the central conductor.

Apart from the shore ends, which had been previously laid by two small craft belonging to the Administrations, the main cable of 240 n.m. was laid by H.M.T.S. *Monarch*, the weight of the cable being over 3,000 tons.

# NEW BOOKS

**The Theory and Design of Inductance Coils.** By V. G. Welsby. Pp. 196; figs. and index. Macdonald & Co. (Publishers), Ltd., 43, Ludgate Hill, London, E.C.4. Price 18s.

The prediction of the inductance and Q factor of a coil, under a given set of operating conditions, involves the consideration of parameters with which many circuit engineers are unfamiliar. Dr. Welsby has attempted, therefore, to state, in concise form, the principles of inductor design, and to indicate how each factor influences the overall performance.

The first two chapters define the basic parameters of inductance coils and their application to equivalent circuits. Inductance formulæ for single and multi-layered coils are then discussed, together with an analysis of eddy current losses, skin effect, the use of "Litz" wire and screening. The properties of gapped and ungapped ferro-magnetic cores are then considered, and expressions developed for core losses. Various types of dust cores are dealt with next, and a comparison drawn between toroidal and pot cores. The variation of Q with frequency for air-cored coils and methods of choosing optimum coil dimensions are discussed.

Chapters are included on graphical methods of presenting coil data for design purposes, and harmonic distortion in iron-cored inductors. The book concludes with a brief survey of the theory of common instruments used for inductance measurements, and several typical examples of coil design.

This work should be welcomed by those interested in the design and application of inductors.—H. B. W.

**Electrical Machines.** By C. Siskind. Pp. 521; figs. 311; index. McGraw Hill Publishing Co., Ltd., Aldwych House, Aldwych, London, W.C.2. Price 40s 6d in U.K.

This book is intended to provide students, who are about to leave college, with an overall picture of the theory and operating characteristics of electrical machines. An elementary knowledge of d.c. and a.c. circuits has been assumed, and the use of mathematics avoided whenever possible. Reluctance to employ simple mathematical operations leads, however, in some cases, to rather lengthy and tedious descriptions. For example, the derivation of the speed and amplitude of the rotating field in a polyphase motor.

The book is in three parts. The first is a brief introduction to electrical machines to indicate the scope of the work. Part two is devoted to the fundamental theory of operation of d.c. motors and generators, together with their individual speed, torque and load characteristics. Various types of starters and speed control methods are discussed. The chapter on the general principles of machine construction and the design of armature windings should prove useful. The theory and methods of testing of the main types of a.c. machines are dealt with in part three. Polyphase induction motors are introduced by an excellent chapter on power and current transformers, induction regulators, etc., and their application to power supply systems.

The average student will have no difficulty in working through the book unaided, and may check his progress by means of the numerous questions to be found at the end of each chapter. The author has produced a very readable and well-illustrated textbook.—H. B. W.

## Books Received

**Electrical Installation Work.** By T. G. Francis. Pp. 232; figs. 137; index. Longmans, Green & Co., Ltd., 6 & 7, Clifford Street, London, W.1. Price 12s 6d.

**An Introduction to Electronics.** By J. Yarwood. Pp. 329; figs. 121; index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 28s.

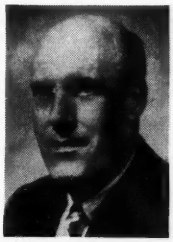
**Testing Radio Sets.** Fifth and Revised Edition. By J. H. Reyner. Pp. 215; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 22s 6d.

**Etude Industrielle Général des Machines Electromagnetiques.** By R. Langlois-Berthelot. Pp. 300; figs. 121; index. Eyrolles Editeur, Paris.

**Elektrische Maschinen.** By Rudolph Richter. Pp. 642; figs 421; index. Springer Verlag, Berlin. Price 49.50 marks.

# A.P.L.E. Conference

## *Papers Presented at Bournemouth*



**The new president, Mr. P. Richbell**

MORE than a thousand delegates, including both British and foreign engineers, have this week been attending the annual conference of the Association of Public Lighting Engineers at Bournemouth. The programme has been a most comprehensive one with five technical papers in addition to the presidential address, together with a full complement of social events.

The conference was officially opened in the Town Hall on Monday (18th September) by Councillor S. A. Thomson, J.P., Mayor of Bournemouth, and after this ceremony Mr. P. Richbell (South Eastern Gas Board) was inducted as the new president in place of Mr. A. S. Tapsfield (Corporation of the City of London).

### Presidential Address

On the following morning Mr. Richbell opened his presidential address by explaining that the objects of the Association were to promote, encourage and improve the science of public lighting and to facilitate the exchange of information on the subject. Referring to the revised articles and byelaws, he said that of the three most outstanding points perhaps the foremost was the formation of the class of "Group" membership which provided for the representation of nationalized and other bodies. The composition was now further strengthened by the fact that technically qualified representatives of firms supplying public lighting equipment were eligible for membership. Apart from this, any member of the staff of a public lighting department could join if he had the requisite qualifications.

The president then gave a brief outline of the Association's activities in conjunction with other bodies and quoted several typical examples of what had been achieved. Referring to work done in collaboration with the Ministry of Transport, he said that because of that body's efforts to improve the æsthetic aspect of lighting equipment on the highways for which it was responsible, the erroneous impression seemed to have been created that all lighting equipment, with particular reference to group "B" lighting, must be approved by the Royal Fine Art Commission. He did feel, however, that the large number of monstrosities used for public lighting equipment in various parts of the country could with advantage be removed.

After briefly reviewing the developments in public lighting during the last hundred years, he returned to the topic of his opening remarks. Although the Association was continuing to grow in membership, the rate of development could be considerably increased as the importance of street lighting was realized by those responsible for this service. The Council was desirous of furthering the interest in public lighting and felt that membership of the Association was the only common ground on which its problems could be fully discussed and in many cases solved.

### Public Lighting Code

The first conference session was held in the afternoon when Dr. J. W. T. Walsh (N.P.L.) delivered an address, the purpose of which was to introduce and direct a discussion on the "Draft Code of Practice for Public Lighting," which has been circulated for comment. He explained why there had been a change from a Specification to a Code of Practice and outlined the composition of the document in question, referring in particular to those points likely to cause the most difficulty: for example, the different classes of light distribution, and the arrangement of light sources and lamps. It is hoped to publish a fuller report of Dr. Walsh's address and of the subsequent discussion in next week's issue.

On Wednesday morning Mr. T. Beecroft (Southern Gas Board) read a paper

on gas lighting, and in the afternoon Mr. E. B. Sawyer (Lighting Service Bureau) presented a paper entitled "Lighting as a Public Amenity." Mr. Sawyer pointed out that although many papers had dealt with the engineering, financial and safety aspects of street lighting there seemed to have been some lack of consideration of the requirements of the ordinary citizen in his various capacities. To satisfy all classes of road user, the lighting must harmonize with the surroundings as well as provide good visibility, although the special requirements of each class tended to weight the character of the lighting to particular needs.

Not unnaturally the motorist, as the fastest moving, and therefore potentially the most dangerous road user, was given the greatest consideration. A special application of public lighting deserving of consideration was the contribution it could make to the enjoyment to be obtained at health and holiday resorts.

## Influence of Road Surface

To present the whole case in a logical manner Mr. Sawyer divided the paper into consideration of the contributions, responsibilities and special interests of those concerned. From the point of view of the lighting engineer, he said, perhaps the biggest problem was the lighting of group "B" roads and side streets. He felt that some co-operation with the civil engineer was necessary to obtain suitable road surfaces, as the average brightness of different road surfaces had been shown to vary by as much as 3 : 1 with the same lantern. Furthermore, co-operation with town planners should make it unnecessary to incur the expense of special equipment where lighting was purely utilitarian. On the other hand, where there were special requirements, such as for important city centres and seaside promenades, there was much in favour of the fittings being placed well above the normal line of vision.

Turning to economics, he said that street lighting cost on an average less than 9d in the pound on the rates, and if the lighting was poor a modest increase would be sufficient to finance a greatly improved installation. This increase might be made more readily acceptable if publicity were given to the value of good street lighting and demonstration sections put in to show the advantages of its adoption.

Good street lighting and suitable equipment should not be restricted to areas containing better-class houses as in built-up areas of flats and poorer property, where a large proportion of the population lived, improvements in public lighting usually resulted in greater cleanliness and safety and a greater care of civic property. In conclusion the author felt that all towns could consider a decorative lighting feature on their main road to mark the boundaries.

## Research Work

The next paper was presented by Mr. A. J. Harris (D.S.I.R.), who discussed some of the problems in road safety which were connected with the lighting of streets. He began by referring briefly to the scope of the work of the Traffic and Safety Division of the Road Research Laboratory of the D.S.I.R., and went on to explain that the Lighting Section dealt with vehicle lighting as well as street lighting and up to the present it had devoted most of its energies to the former.

In the field of street lighting there were the long-term problems of relating the accident situation to the quality of the lighting and of finding a satisfactory measure of the visibility in a lighted street. It was felt that the Laboratory was especially well placed for making a useful contribution here, since it was concerned with all other features of the road surface, particularly slipperiness. The demand of the road engineer for a non-skid surface would have to be reconciled with the lighting engineer's demand for a surface that would not waste most of the light which his lamps threw upon it.

The remainder of the paper was devoted to the two problems on which the Laboratory was now working, the first of these being the revealing power in lighted streets. The author showed that although it did not appear possible to exhibit revealing power as a function of one or two simple variables, fairly accurate results could be obtained if one averaged the illumination of the vertical surfaces.

He then went on to demonstrate that it was more convenient to plot revealing power against the ratio of street brightness to mean illumination than against

the mean illumination. This ratio was shown to be the most important factor in the whole situation. In conclusion Mr. Harris discussed some of the applications of surface reflection properties to the design of pedestrian crossings.

The final paper is being presented this morning (Friday) by Messrs. P. H. Collins, H. P. Walker and W. E. Harper (I.C.I.). In dealing with the performance and design of acrylic plastic street lighting equipment the authors point out that although the acrylic plastic polymethyl methacrylate (or "Perspex" as it is more commonly known) is similar in appearance to glass, the optical properties only are the same. As a material it is comparatively new, and equipment must be designed with an understanding of its physical characteristics and of the methods of fabrication applicable to it.

This being so the authors devote the first section of the paper to setting out the necessary design data derived from laboratory and service tests. A broad review of modern lanterns incorporating methacrylate components follows and it is indicated that although the use of the material with filament lamps is increasing, and designs were in being for h.p.m.v. lanterns, it is probable that the major use of unmodified methacrylate will continue to be in sodium vapour and fluorescent lamp fittings. There also seem to be possibilities for developing lanterns which will reduce maintenance.

## 1,000 W Mercury Lamp

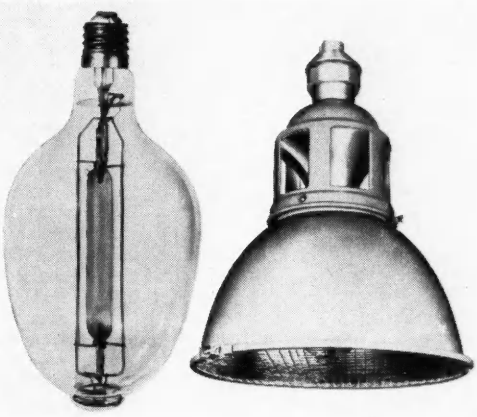
THE largest mercury lamp hitherto in general use for lighting large areas in industrial premises has been the 400 W size, and to provide satisfactory illumination in spacious and lofty buildings considerable numbers have had to be used. The Osram 1 kW mercury lamp recently introduced by the G.E.C. enables the lighting of such premises to be carried out efficiently with a smaller number of lamps and a consequent reduction in installation and maintenance costs.

The new lamp has an average efficiency throughout its life of 45 lumens/W, which is some 25 per cent higher than the corresponding figure for the 400 W lamp, and the average light output of 45,000 lumens is nearly twice that of a standard 1,500 W gas-filled tungsten lamp. The lamp has a bulb of isothermal shape fitted with a G.E.S. cap.

Having an arc voltage of about 300 V, the lamp requires a mains supply of the order of 400 V. Two standard 400-W chokes connected in series will provide the necessary stabilization on 420 V and above. A tapped choke to cover the full range of voltages from 350 to 450 is in preparation.

A high bay reflector fitting which has been developed for this lamp is designed to give the best utilization of light when the unit is mounted at a considerable height. It consists of an anodized aluminium reflector mounted below a vitreous enamelled canopy with large ventilation slots, and carrying an auxiliary "Saaflux" type aluminium reflector cone and skeleton lampholder. A clip-on 0.5in wire mesh guard is provided.

Some upward light is emitted through the ventilation slots, and deposition of dirt on the reflecting surfaces is retarded by the convection air stream. The reflector is detachable from the canopy to permit cleaning without disturbing the lamp.



**The new "Osram" 1kW mercury lamp and (right) high bay reflector fitting for use with it**

# Radio Progress

## *Review of the Birmingham Exhibition*

By W. E. MILLER, M.A.(Cantab), M.Brit.I.R.E.

THE annual National Radio Exhibition, which this year, for the first time, was held outside London, at Castle Bromwich, Birmingham, was a full-scale show, with ninety exhibitors occupying an area two-thirds the size of that usually employed at Olympia, London. The exhibition closed on 16th September and there is every indication that from the business point of view it has been highly successful; the attendance was over 128,000.

As usual, the British Broadcasting Corporation co-operated to the full. A complete television studio and control room were erected and the public was able to file past glass windows to see the studio activities while a transmission was in progress. At times when no studio performance was available, either from the show studio or from Alexandra Palace, one of the B.B.C.'s tele-cine projectors was in use in an annexe to the studio and could be seen in operation. All the television receivers working in the show, well over 100, were operated on a closed circuit and on the London frequency to avoid interference and spurious pick-up from the Sutton Coldfield transmitter, only three miles away. Apart from those on the stands, there was a communal demonstration of various makes of set.

### Television Receivers

An outstanding feature of the television receivers this year was a well-defined tendency for the 12-in tube models to take the ascendancy. True, there were still a number of 9-in and 10-in models, but they were less prominent than in the past. A number of the well-known manufacturers concentrated entirely on 12-in models, though a few had one of the smaller types as well, to cater for the lowest-price class. Some of the 12-in table models, however, were no more expensive than 9-in types of a year or two ago, ranging in price from about £55 to £70, including purchase tax. The average price for a 9-in table model was about £45, the cheapest of all being priced at just under £35.

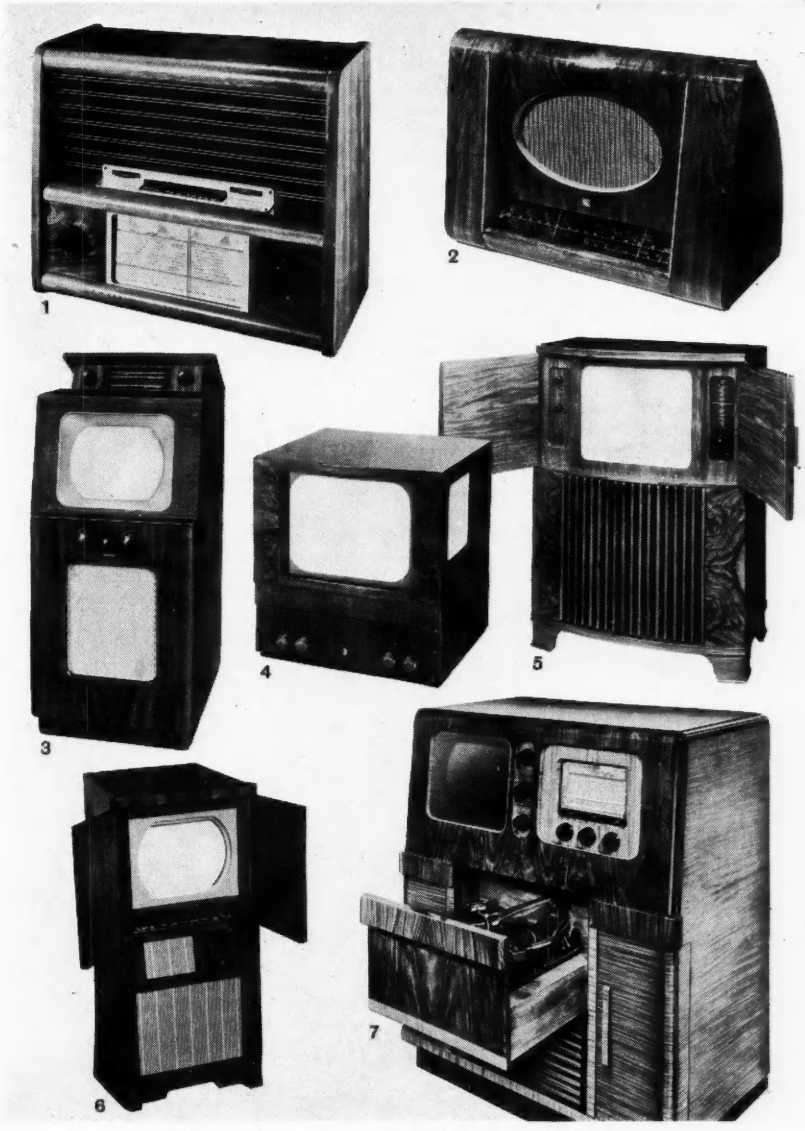
For the first time a number of models with adjustable tuning, to cover all the proposed B.B.C. television stations, were shown. This has become almost inevitable with the necessity for catering for five different frequency channels in the course of the next two years. Up to now, models designed to receive either the London or the Birmingham station, but not both, have been available.

### Anode Voltage Supply

Last year many receivers obtained their voltage for the tube anode from the line scanning output valve, where the line flyback pulse rises to a high voltage. This pulse, transformed to an even higher voltage and rectified by a special valve, is an economical source of the 6 to 8 kV necessary. This year, the "fly-back" method of anode supply is almost universal. Naturally, a special type of line output transformer is needed and must be very carefully insulated. In some cases, the transformer is of the oil-filled type.

There is no general change-over to the a.c./d.c. type of television receiver, many manufacturers still concentrating on a.c. models only. Some makers list both types, while only one or two have a.c./d.c. types exclusively.

For screen sizes larger than that obtainable from a 12-in tube, some sets are available with 15-in tubes and they are the largest in general use for direct viewing. The next step is in the direction of projection models, shown by a number of manufacturers. They were also shown at Radiolympia last year, but few were produced. This year, at prices around £120, they may attract a certain definite demand. Screen sizes vary, typical ones being 18in by 14in, 16in by 12in and 14in by 10in (all sizes approximate). One manufacturer makes a "table" model of the last-mentioned size which sells at




**Some Equipment Shown at the National Radio Exhibition**

1. A table radio receiver with pre-set tuning and twin loudspeakers (G.E.C.). 2. This new table receiver employs an elliptical loudspeaker (H.M.V.). 3. Television receiver incorporating a three-band radio set at the top of the cabinet (Cossor). 4. A table projection TV receiver, giving a 14in by 10in picture (Philips). 5. Another projection TV receiver, incorporating also a radio receiver (Decca). 6. A 12in tube television console, with a two-band radio receiver (Ferranti). 7. Combined television and radio receiver, with auto-radiogram and space for record storage (Ferguson).

under £90. The projection tube is in all cases of 2½in diameter.

One other innovation this year is the so-called "black screen" television. This is merely an ordinary receiver with a grey-tinted plastic screen in front of the tube face. In America this type of set has had a certain vogue, though there the tube end itself is of tinted glass. The action of the tinted filter is to cut down the effect of room light falling on the face of the tube, which normally reduces the contrast of the picture. Naturally, it also absorbs some of the light from the tube face, necessitating either a somewhat higher anode supply or greater use of the "brightness" control.

Though there is no radical change in television receiver circuits, there has been a certain amount of detail improvement and cleaning up. In particular, synchronizing circuits have been made more positive, even in the presence of interference pulses, so that sets become more stable and simple to operate.

One possible criticism is that the move to cut costs in the low-priced table models has made it necessary to fit very small loudspeakers, often at the side of the cabinet, and very simple a.f. amplifiers, so that the accompanying sound, though adequate, is nowhere near the quality which is actually transmitted.

## "Ordinary" Radio Sets

It might be thought from the foregoing that television had practically ousted the ordinary radio receiver and radiogram. This, of course, is not the case, but it is natural that development should be more noticeable in the comparatively new television technique.

Perhaps the most obvious tendency in radio receivers is the increase in portable and semi-portable models in stylish plastic cabinets. There is no doubt that the modern plastics industry has revolutionized this type of receiver. Circuit changes have been few, but the use of the latest miniature "all-glass" valves and "miniaturized" components has enabled very compact sets to be produced.

Battery models are now almost always of the "all-dry" type, in which the accumulator for filament supply has been replaced by the dry-cell battery. The special 1.4 V valves now available have made this change possible. A growing tendency this year is towards the production of the mains/battery type of portable receiver. The circuit changes necessary are relatively simple and the system is quite effective.

Ordinary table or console receivers have undergone very little change, apart from the cabinet work, though the widespread use of negative feedback in the a.f. circuits and the employment of modern high-quality, though comparatively small, loudspeakers has resulted in a general improvement of tone quality in quite inexpensive models. Most of the elaborate sets utilize band-spread tuning for the short-wave bands, and naturally this is fairly general in export models.

In a number of sets a simple form of pre-set tuning, operated by switches, press-buttons, or keys, is employed for reception of local stations; in one or two sets, no variable tuning is used at all.

## Multi-speed Radiogram Motors

The most noteworthy change in radiograms is the incorporation of multi-speed motors, enabling the standard 78 r.p.m. or the new 33⅓ r.p.m. "long-playing" records to be used. In actual fact, the motors are usually of the three-speed rim-driven type, the third speed being 45 r.p.m. for certain American records.

As the long-playing record has a very fine groove necessitating a special reproducing point, it is usual either to have separate pick-ups and arms for the two types of record, or to have a single arm with interchangeable plug-in pick-ups.

There has been a tendency to produce small table radiograms in recent years, possibly on account of the prevalence of small living-rooms in modern houses and flats. This tendency is increasing and a number of types were exhibited.

Naturally, at the other end of the scale, luxury furniture into which television sets, radiograms, cocktail cabinets, bookcases and other requirements are built were prominent, several firms specializing in this type of product; prices of the order of £600 were not uncommon.

Finally, although fewer component manufacturers than usual were exhibiting, there were enough accessories on display to make it clear that the general tendency is towards reduction of size wherever possible without affecting electrical performance or mechanical strength.

# Commerce and Industry

## National Inspection Council

## Constitution of Steel Corporation

DISCUSSIONS on the conversion of the National Register of Electrical Installation Contractors into a National Inspection Council are still proceeding. The Organizing Committee which is dealing with the matter has suggested the bodies which should appoint representatives to the General Council and it also recommends the setting-up of an Inspection Board to superintend the carrying out of the work of inspection. It is proposed that this should be composed of representatives of the following interests:—Electricity Boards (2), contractors (2), local authorities (2), I.E.E. (1), trade unions (1), Electricity Consultative Councils (1) and Royal Institute of British Architects (1). An endeavour is being made to secure that there shall be two trade union representatives to enable the Electrical Power Engineers' Association and the Electrical Trades Union to appoint one each.

### Electrical Material Prices

The *Board of Trade Journal* (16th September) sets out in tabular form the course of prices of the materials used in the electrical machinery industry from the beginning of 1945 to August this year. Thirty-two materials are covered, ranging from foundry pig iron and various classes of steel products, through non-ferrous metals, to insulation of several kinds. It is shown that with the figure for 30th June, 1949, as a base (100) the price index has risen from 74.2 in January, 1945, to 122.5 last August. The rise this year has been comparatively steep; the index started at 109.4 in January.

### Iron & Steel Corporation

Mr. G. R. Strauss, Minister of Supply, announced on 14th September the names of the members of the Iron and Steel Corporation of Great Britain set up under the Iron and Steel Act. They are as follows: Chairman, Mr. S. J. L. Hardie, chairman of the British Oxygen Co., Ltd., and Metal Industries, Ltd.; deputy chairman, Sir John Green, director of Thos. Firth and John Brown, Ltd.; Sir Vaughan Berry, British delegate, International Authority for the Ruhr; General Sir James Steele, Adjutant-General to the Forces; Mr. W. M. Stokes, Amalgamated Engineering Union; Mr. J. W. Garton, chairman, Brown Bayley's Steelworks, Ltd., and managing director, Hoffman Manufacturing Co., Ltd. (part-time member); and Mr. R. A. Maclean, chairman, A. F. Stoddard and Co., Ltd. (part-time). Mr. Maclean later informed Mr. Strauss that he had decided to withdraw his consent to serve on the Corporation.

The vesting date for the assets of the companies listed in the third schedule of the Act has been fixed at 1st January next or as soon as practicable thereafter.

### E.P.E.A. (South Eastern Division)

The annual dinner and dance of the South Eastern Division of the Electrical Power Engineers' Association will be held on 10th November at the Connaught Rooms, Great Queen Street, London, W.C.2. The principal guest will be the Minister of Fuel and Power (Mr. P. Noel-Baker). Tickets (£1 1s each to members, and £1 10s each to non-members) can be obtained from Mr. F. H. Smethurst, hon. secretary, South Eastern Division, 118, New Kent Road, London, S.E.1 (telephone: Rodney 3085).

### Simplex Fluorescent Lighting Fittings

The Simplex Electric Co., Ltd., has entered the fluorescent lighting fittings business and its present range of fittings includes Simplex "Seagull" and channel fittings in three sizes—3ft 30 W; 4ft 40 W; and 5ft 80 W; and industrial reflectors in two sizes—4ft 40 W and 5ft 80 W.

### Cliff Quay Fatality Action

A summons against the British Electricity Authority alleging that it had failed to protect an electric light fitting at Cliff Quay power station was dismissed by the Ipswich magistrates last week after a hearing lasting most of the day. William Kenyon & Sons, Ltd., of Dukinfield, Ches., engaged as sub-contractors at the power station, who were brought to court by the B.E.A. as the party responsible, were fined £50 with £19 costs. The chairman said that the magistrates had come to the

conclusion that the B.E.A. had established that they used all diligence. Mr. R. H. Goddard, for Wm. Kenyon & Sons, said he had been instructed to give notice of appeal. The accident out of which the case arose occurred on 1st March last when Ernest Frank Peake (35) died after touching an uncaged 200 W, 240 V lighting fitting. Mr. T. A. Symes, for the B.E.A., said the Authority did not admit that Peake died from electric shock. It was stated that the lampholder and the cap of the lamp could not be found.

## Grey Ironfounding

The productivity team from the grey ironfounding industry which visited the U.S.A. early this year has presented a comprehensive report which contains many recommendations for increasing productivity in this country. The report has over 100 illustrations. Copies of the report (price 3s 6d, post free) can be obtained from the Anglo-American Council on Productivity, 21, Tothill Street, London, S.W.1.

## Scrap Iron and Steel

Under the Iron and Steel Scrap Order, 1950, S.I.1950 No. 1523 (H.M. Stationery Office, price 6d) which came into force on 18th September, the Control of Iron and Steel (Scrap) Orders 1943-1950 are consolidated. The new Order releases scrap alloy steel, including stainless-steel scrap, from price control, but not from control of acquisition and disposal. The schedule to the new Order also lists a limited number of price amendments.

## G.E.C. Dry Battery Scheme

As a result of a rapid increase in its dry battery business at home and abroad and the introduction of highly mechanized production processes, the General Electric Co., Ltd., has reorganized the distribution of its batteries by the creation of a battery central stores at its Witton works. By this means, the production of batteries will be synchronized more closely with demand at G.E.C. branches and depots and the average time which will elapse between manufacture and entry into a dealer's premises will be considerably reduced.

## Cleveleys Service Centre

The opening of the new North Western Electricity Board service centre in Victoria Road, Cleveleys (Lancs) on 1st September provided facilities long needed in a coastal area which is both a residential district and a watering place. Councillor J. T. Grundy, J.P., chairman of the local Urban District Council, opened the new centre in the presence of Sir Joseph Hallsworth, M.A., chairman of the Board, and members and officials of both the Board and the U.D.C. The centre was formerly an antique shop. It has been attractively decorated and comprises showroom, demonstration room facilities for the payment of accounts, and offices.

## Electron Microscopes for Paris

The Metropolitan-Vickers Electrical Co., Ltd., sent two electron microscopes by air for display at the exhibition of the International Congress of Electron Microscopy now in progress in Paris.

## Dunfermline Electrical Society

The Dunfermline Electrical Society has recently been formed, the hon. secretary of which is Mr. J. Thomas, c/o James Scott & Co., 97, Campbell Street, Dunfermline, and the hon treasurer, Mr. T. McPhee, c/o S.E. Scotland Board, East Port, Dunfermline. Dunfermline is the centre of the Fife electricity supply while at Rosyth Dockyard many people are engaged in naval electrical work. Up to the present 150 members have been enrolled.

## Control of Vital Exports

Last Monday, on an Opposition motion moved by Mr. Oliver Lyttelton, the House of Commons debated the export of machine tools and other equipment likely to be employed in the production of armaments to Eastern European countries. The House accepted a Government amendment providing for the stopping of exports of this kind in appropriate cases and extending controls on exports of equipment and materials of military value while still maintaining trade between this country and Eastern Europe.

The President of the Board of Trade (Mr. Harold Wilson) promised that the existing situation would be examined and the necessary steps to extend control of these exports would be taken. There would be no "economic blockade" of the countries of Eastern Europe.

## New London Telephone Exchanges

The Post Office is planning four new telephone exchanges in the City of London, to be built in the next seven years. Two, which will serve London Wall and Avenue exchange areas, will be in Houndsditch. Sites for the other two exchanges, which will give relief to the areas served by Monarch, Metropolitan and Central exchanges, have not yet been fixed.

## P.O.A. "Minibition"

In our issue of 18th August we referred to the "minibition" which is being held at the Hotel Metropole, Brighton, from 28th September to 1st October in conjunction

with the National Conference of the Purchasing Officers' Association. There will be 100 stands and the exhibitors will include the following:—Bakelite, Ltd.; Thomas Bolton & Sons, Ltd.; British Thomson-Houston Co., Ltd.; English Electric Co., Ltd.; Foster Instrument Co., Ltd.; Hackbridge Cable Co., Ltd.; Johnson, Matthey & Co., Ltd.; London Electric Wire Co. and Smiths, Ltd.; Morgan Crucible Co., Ltd.; Plessey Co., Ltd.; Rheostatic Co., Ltd.; Siemens Electric Lamps & Supplies, Ltd.; Venner Time Switches, Ltd.; Westinghouse Brake & Signal Co., Ltd.; and Yorkshire Copper Works, Ltd.

## Works Visit

About thirty correspondents representing the Press and radio services of more than a score of overseas countries visited the works of the Pressed Steel Co., Ltd., Cowley, Oxford, recently, to inspect Prestcold refrigeration manufacture. On arrival they were entertained to lunch, at which Mr. E. G. Rowledge, general manager, Refrigeration Division, welcomed them and gave them some information about the company and its history. They were then shown the company's new film, "The Prestcold Story," and proceeded to tour the works. Following this, tea was provided. Dr. T. Basu, representing the *Hindustan Standard*, thanked the company on behalf of the visitors.

## Electrical Distributors' Showrooms

New electrical showrooms were opened on 4th September by Metropolitan Distribution, Ltd., at 9, River Street, Truro. The ceremony was performed by Mr. P. G. Wallis, president of the Electrical Contractors' Association, who said that in Kent, from where he came, competition with the nationalized industries was keen but fair, and if there were complaints of unfair trading with nationalized competitors they had a liaison committee which dealt with such matters. He urged electrical contractors in the West Country to make greater use of their liaison committee. Mr. A. E. Gladwell, managing director of Metropolitan Distribution, Ltd., referred to the unfair competition of nationalized industry and suggested that manufacturers and wholesalers should get together and agree to supply the nationalized competitor at the same prices and discount as the contractor received. Mr. S. Geipel, managing director of William Geipel, Ltd., and Councillor F. Richards, the Mayor of Truro, also spoke. The opening ceremony was attended by a number of representatives of well-known electrical manufacturers.

**The new showroom of Metropolitan Distribution, Ltd., which has been opened in Truro**

## British Exhibits in Turkey

The British Pavilion at the Izmir (Turkey) International Fair, which closed on Wednesday last after a month's run, was the largest foreign display in the show. It was organized by the British Chamber of Commerce of Turkey and the products of over 300 manufacturers were exhibited on 83 stands. The items included motors and alternators, refrigerators, electric lighting equipment, washing machines, radio apparatus, etc.

## Contractors' Apprentices

When dealing with the new apprenticeship scheme for the electrical contracting industry in our last issue we should have mentioned that copies of the model deed of apprenticeship and other forms can be obtained from the Registrar, Apprenticeship and Training Council for the Electrical Contracting Industry, Ministry of Works, Lambeth Bridge House, Albert Embankment, London, S.E.1.

## Festival Lighthouse

In the Great Exhibition of 1851 Chance Bros. showed the first British lighthouse optical apparatus. At next year's Festival of Britain Exhibition in London the company's

apparatus will again take a prominent position—at the summit of the old Shot Tower which has been retained amid the general clearance. This time, of course, the equipment will be all-electric. The source of light for the double flashing beam will be a 3 kW lamp fitted on an automatic lamp changer which will operate if the lamp fails. The equipment will be housed in a 7ft diameter lantern mounted on a ball-bearing pedestal and turntable rotated by a motor, with another motor as stand-by. In favourable weather the beam will be seen from 45 miles away.

## Forward Buying

In the House of Commons on 18th September, Mr. John Grimston asked the Minister of Supply what proposals he had to compensate exporters of heavy electrical equipment, who needed to cover their requirements many months ahead, for having to pay the premium on their forward purchases of copper, which he had imposed in order to prevent speculation.

Mr. Strauss said that the premium was imposed to protect the Exchequer from the results of heavy forward buying at a time of great uncertainty about future buying prices. The matter was under discussion with industry to see whether an alternative method could be found which would be more acceptable to the trade while providing the necessary protection to the Exchequer.

## Brown Bros.' New Hull Premises

The new building of Brown Brothers, Ltd., at Francis Street, Hull, was officially opened on 5th September by the Lord Mayor, Councillor H. J. Barney, supported by Mr. R. E. Manningham-Buller, deputy chairman of Brown Brothers; Mr. J. T. Masterton, assistant managing director; Mr. K. E. Comport, joint general manager; Mr. J. J. H. Stratton, sales promotion manager garage equipment; Mr. M. S. Inglis, branch manager; and 250 guests representing retail and manufacturing interests.

## Trade Announcements

The London branch of **Brook Motors, Ltd.,** has been removed to 16-18, Palmer Street, Westminster, S.W.1 (Telephone: Abbey 7626). Warehouse accommodation is provided for stocks of motors and starters. A showroom with display windows on the Palmer Street frontage will be completed shortly.

As from 23rd September, the Marine Department of **Siemens Brothers & Co., Ltd.,** will be at 5, Rumford Place, Liverpool, 3 (telephone: Central 5154; telegraphic address: Siemens, Liverpool). The telephone number of Siemens Electric Lamps & Supplies, Ltd., 81, Dale Street, Liverpool, will be Central 2660.

**The Provincial Wholesale Co., Ltd.,** has opened a new branch at 21, Copeland Street, Stoke-on-Trent (telephone: Hartshill 1945).

Mr. A. G. Steers has been appointed by **T.M.C.-Harwell (Sales), Ltd.,** to represent it in Lancashire, Cheshire and North Wales, and Mr. R. C. Betts will represent the company in Yorkshire and North Lincolnshire for the sale of "Temco" wiring accessories and synchronous clocks.

Mr. N. H. Tuff, 84, Chalford Oaks, Acklam, Middlesbrough, has been appointed representative of **Ekco-Ensign Electric, Ltd.,** covering the Tees-side area. He will be based at the company's Preston office at Kent Street Works.

T. Beadle & Co., Ltd., 3-5, Castle Street, Hull, have been appointed distributors for **Tillings-Stevens** electric motors.

The Leeds office of **W. T. Glover & Co., Ltd.,** is now at Britannia House, Wellington Street, Leeds, 1 (telephone: Leeds 31500).

The **Electric Meter Co.** has removed from Torquay to Castor Road, Brixham (telephone: Brixham 3284).

**T. F. James, Ltd.,** has acquired Volta Works, New Brunswick Street, Thornes Lane, Wakefield, from where the business of the company will in future be conducted.

To meet increased demands for "Mopal" compressor products, the **Overseas Engineering Co., Ltd.,** has acquired larger warehousing and factory premises at 29, Brewery Road, N.1, and goods should be sent to this address. Correspondence should still be sent to the head office, 194/200, Bishopsgate, E.C.2.

## Catalogues and Lists

**Chas. Clifford & Son, Ltd.,** Dogpool Mills, Birmingham, 30.—40-page handbook containing detailed information on non-ferrous metals in various forms, together with a wealth of useful tables and data.

**General Electric Co., Ltd.,** Magnet House, Kingsway, London, W.C.2.—Priced folder on fluorescent, neon and tungsten filament lamps.

**Venner Time Switches, Ltd.,** New Malden, Surrey.—Priced folder (No. T.S.25) describing the type MSDC synchronous time switch with solar dial for double-circuit or double-pole switching.

**Mantel Metalworkers, Ltd.,** Stuart Road, Peckham Rye, London, S.E.15.—Three priced catalogues of "Zedlok" consumers' supply control units for houses and flats and catalogue of cable trunking and fittings.

# The Fannich Project

## *Completion of Intake Tunnel for Water Power Station*

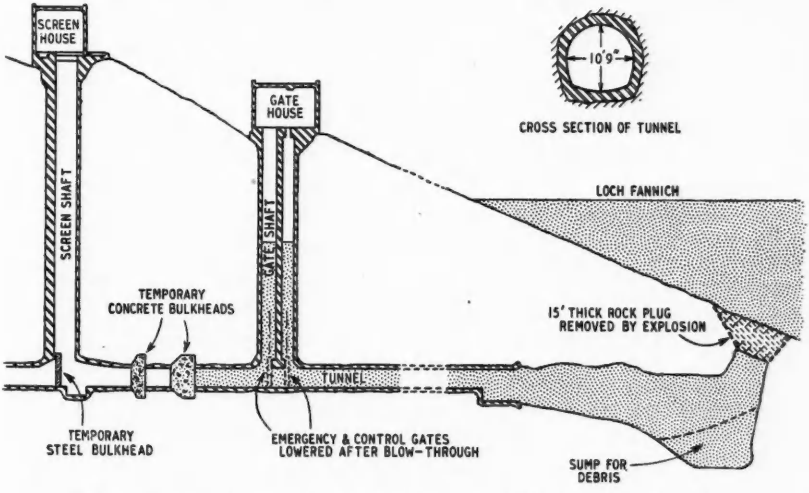
**Lady MacColl closing the switch of the electrical detonator**

BY electrically detonating an explosive charge, which removed a 15ft rock plug, Lady MacColl linked an intake tunnel with Loch Fannich, Ross-shire, on 7th September, thus allowing stored water to flow to the Grudie Bridge power station, one of the machines in which is expected to commence generating in about a month's time.

The power house contains two 12,000 kW turbo-generators operating under a gross head of 530ft of water. The ultimate annual output will be 79 million kWh. This station is the forerunner of a group of six in the Conon basin which, when completed by the North of Scotland Hydro-Electric Board, will be of 107,000 kW capacity and have 450 million kWh annual output.

The Fannich intake has taken 2½ years to construct, the contractors being Balfour, Beatty & Co., Ltd. The length of the tunnel to the portal at the head of the pipe-line overlooking the Grudie Bridge station is over 3½ miles; it is of horseshoe section, 10ft 9in high and wide, 11ft equivalent diameter, to convey water at the rate of 370 million gallons a day. Its construction involved the excavation of 150,000 tons of rock and the deposition of some 80,000 tons of concrete lining.

The intake is 80ft below the surface of the loch, which will hold 30,000 million




**Cross-sectional diagram of the Fannich intake tunnel prior to the blow-through**

**Simplified map of the Conon basin area in Ross-shire**

gallons of water. Sir Alexander Gibb and Partners designed the tunnel, which is 104ft below water level and has been driven towards the underneath of the loch from two shafts forming the screen and gate houses respectively. It is 45ft deep and 17ft wide at the sump end, to accommodate debris from the blow-through explosion. After scraping loose materials from the bed of the loch to expose the rock, over 100 holes were drilled into a thickness of 15ft and loaded with ¾ ton of explosive (Imperial Chemical Industries, Ltd.) to blow out about 400 tons of rock.

To avoid a dangerous inrush of water the tunnel was filled with water to some 12ft below the level of the loch, which negative head encouraged the debris to fall back into the sump.

The force of the explosion was estimated to be of the order of 120 tons/sq ft; to withstand it three protective bulkheads were built. The first was 13ft thick and contained 85 tons of concrete; the second, 6½ft thick and containing 40 tons of concrete, was provided 36ft from the main bulkhead; while the third consisted of a gate of steel joists at the bottom of the screen shaft.

After the explosion the two gates in the gatehouse were to be lowered to the bottom of the shaft to cut off water from the tunnel to allow demolition of the temporary bulkheads. Glenfield & Kennedy, Ltd., are responsible for gates and hydraulic equipment.

This method of connecting an intake has been little used in this country, or abroad, owing to the risks which are entailed in tunnelling close to the bed of a loch. The tunnel supplying water to the power station for the aluminium works at Fort William was connected to Loch Treig in 1930 in a somewhat similar manner by the same firm of contractors.

Loch Fannich, without a dam, provides the equivalent of 75ft of storage, which should allow the Grudie Bridge station to operate for a year, even if there is no rain at all. The loch level will be raised a further 25ft when a dam is constructed at a later date. The power station discharges water almost directly

into Loch Luichart, at the foot of which will be another power house to use the water a second time; it will be used for a third time by the Torr Achilty station on the River Conon.

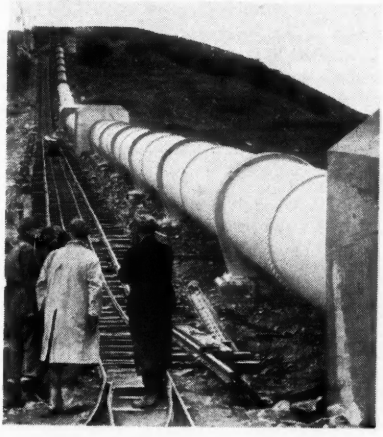
During the construction of Fannich tunnel the average number of men employed has been 350, with a peak of 700 in April, 1950.

Sir Edward MacColl, deputy chairman of the Board, said that the Grudie Bridge station would make a very substantial contribution to the supplies available to meet what was becoming a somewhat difficult position for the Board. "We are now short of power because of the very rapid growth of demand in this area," said Sir Edward. "The development and expansion of the distribution areas had made very large demands for power and this station's output will be completely absorbed during this winter." The completion of the Fannich scheme would also mark the beginning of a social experiment in that when the group of six stations was completed, even before then, it would be operated remotely from a new village and control centre at Contin, about twelve miles away. The Board felt that it would be better to have its staff at a central point where there were social, educational and transport facilities, rather than have them isolated at the individual stations.

Contracts would shortly be let for two of the stations of the next development of the Conon basin group scheme, those at Loch Luichart and Torr Achilty; the stations at Glascarnoch, Achanalt and Orrin would follow and, when completed, their combined power would be about 100,000 kW with an annual output of 450 million kWh. They would all be controlled and operated as one unit. The Conon basin stations were not being built as a peak load group, but were intended to supply energy to industries in the North of Scotland.

The Board hoped to complete the whole group scheme in about seven years' time. It would have to be carried out in stages, as Scotland had a limited amount of man-power and the Board could not flood the market with several large contracts at the same time. There was also a "ceiling" on capital expenditure. Sir Edward added that the Board was spending £2,500,000 per annum on distribution alone.

**Pipe-line from tunnel to the power station**



## Colliery Exploders

THE publication is announced of Safety in Mines Research Paper, No. 107 (H.M. Stationery Office, price 6d) which examines the electrical properties of low voltage detonators with the object of minimizing the risk of misfires. From the data given it is possible to deduce the characteristics appropriate to exploders intended to fire simultaneously a round of shots connected in series.

Drs. G. Allsop and E. M. Guénault explain in this paper that, for the same reliability of performance, the output of a d.c. machine need only be small compared with that of an equivalent a.c. machine. It is further shown that a condenser discharge combines the advantages of d.c. firing with limitation of current, which is desirable for safety; the principles of design relevant to condenser-type exploders are summarized. Data are included from which it is possible to estimate the voltage and capacity needed to fire a round of shots, up to twenty, and to gauge the permissible misfire chance, with precautions to limit the danger of igniting an explosive gas mixture. The risk that can be introduced by residual capacity in the exploder is made clear as is also the fact that it is almost impossible to produce a multi-shot exploder to fire more than about six shots which will not ignite methane-air mixtures.

Misfires can be caused in several ways; there is no sure means of guarding against this risk, short of testing every detonator at the pits in which they are used.

# FINANCIAL SECTION

## Company Notes and Stock Exchange Activities

### REPORTS AND DIVIDENDS

**The Mid Southern Utility Co., Ltd.**—At an extraordinary meeting held on 14th September approval was given to the final distribution scheme, following the nationalization of the company's gas and electricity undertakings and the sale of its water undertakings. The cash payment to debenture stockholders will be made on 30th September. Preference stockholders will receive transfers of British Electricity stock and British Gas stock to which they are entitled on 31st October, and the ordinary stockholders on 30th November. The chairman explained that the position as regards ordinary stockholders was that the residue of "A," "B" and "C" stocks will be negotiable and represented the proportion which would be entitled to the assets remaining for distribution. The directors themselves consider it advisable to retain the balance of their respective holdings and advise stockholders to do the same.

**Thorn Electrical Industries, Ltd.,** held its annual meeting on 12th September, when Mr. J. Thorn (chairman and managing director) said that during the year the output from all their factories was considerably increased, but growing overseas competition necessitated reductions in their selling prices. Their lighting division had again made progress in the incandescent field, while in fluorescent lamps they had become the largest individual manufacturers in this country, and technically and commercially in this field, as well as in illuminating engineering, fittings and lighting installations, they had built up an international reputation. A number of theatres and cinemas had recently adopted their new dimmer-controlled fluorescent stage lighting. They owned one of the only two lamp-cap factories in the Empire. Apart from meeting the growing demand of their own lamp factories, they had obtained large contracts from both home and overseas lamp manufacturers. They had also acquired a 51 per cent interest in the Ekco-Ensign lighting organization. Their co-operation with their American associates, Sylvania Electric Products, Inc., was satisfactory.

Their export trade had continued to show satisfactory expansion, and during the year they had developed an interesting trade in fluorescent lamps, control gear, and radio receivers with Central and South America and other hard currency areas. Their Ferguson television and radio division had experienced considerably increased demands for its products since Radiolympia last year. During the last few weeks they had marketed a new 12in television receiver which had met with outstanding success. Orders already received exceeded their output for the rest of the year. Substantial business had also been booked for their whole range of radio sets and radiograms.

**Newton Brothers (Derby), Ltd.,** report a trading profit for the year ended 31st March last of £115,007, as compared with £84,421 for 1948-49, and after deducting £5,000 reserve for stock contingencies, and adding investment income, etc., there is £112,500 available. Depreciation requires £9,374, directors' emoluments £10,323, and taxation £54,054, leaving a net profit of £38,749 (against £28,893), to which is added £14,808 brought in, making £53,558. Reserves receive £15,117, pension funds £9,000, and it is proposed to pay a dividend of 10 per cent and a bonus of 5 per cent, both less tax. The balance carried forward is £16,407. During the year £78,992 of general reserve was capitalized and one fully paid share of 2s for each share held was issued free to shareholders. In the previous year the total distribution on the old capital was 25 per cent, which included a bonus of 7½ per cent.

**The Electric Furnace Co., Ltd.,** reports a consolidated trading profit for the year ended 31st March last of £75,683, as compared with £49,711 for the preceding year, to which is added other revenue, making £84,899. After providing for depreciation, interest, etc., there is a balance of £50,413 (against £22,655), to which is added £15,000 excess tax provision. Taxation requires £17,409, general reserve receives £20,000, and stock reserve £5,000. The dividend for the year is unchanged at 8 per cent, and £13,403 is carried forward (against £13,639 brought in).

In his statement which accompanies the report and accounts, Mr. D. F. Campbell (chairman) says that orders for new plant have been well maintained during the year, and it seems probable that further modernization of metallurgical works must proceed, and bring additional work to the company. Efforts are being made to increase

the efficiency and productivity of their organization by the concentration of their manufacturing activities at Burton-on-Trent, where extensions are being carried out. Induction hardening for engineering firms is an increasing source of income.

Export business has become more and more difficult, but in spite of this important orders have been received from Canada, Spain, Italy, Switzerland, Holland and Scandinavian countries. The subsidiary companies have all been active, and a great increase in demand for electroplating equipment has developed. Two other companies engaged in the manufacture of small furnaces and heat treatment for the trade, in which they have a participation, both show profits on the year's work. Their small shareholding in Sun-Vic Controls has been sold. At the present time the value of unfilled orders is about equal to the highest yet recorded, and the period of delivery is being reduced.

**Metal Industries, Ltd.**—At the annual general meeting on 15th September, Sir J. Donald Pollock, chairman, stated that an analysis of the company's interests now showed that investment in the Electrical Division, which comprises the Igranic Electric Co., Ltd., Brookhirst Switchgear, Ltd., and Cantie Switches, Ltd., amounted to £1,938,000, compared with £1,724,000 in the Engineering Division and £747,000 in the Metals Division. It was expected that the companies in the Electrical Division might repeat in the current year the very good production and profit of the past year. The Igranic Electric Co., Ltd., again reached record figures last year.

**Vactric, Ltd.,** reports a consolidated trading profit for the year to 31st March last of £145,588, as compared with a loss of £59,507 for the preceding year. From this are deducted audit fees £1,844, interest on Treasury loan £13,600, depreciation £33,557, and reduction in stock values for redundancy and obsolescence £16,247, leaving a balance of £80,340 (against a loss of £98,605, less unrequired tax reserves £10,580). Taxation absorbs £9,106, leaving a net profit of £71,234 (against a loss of £90,868), reducing the loss carried forward from £100,411 to £29,177. The parent company's trading profit was £144,161 (against a loss of £17,440), and the net profit £85,737 (against a loss of £59,234). After making various deductions the loss carried forward is reduced from £131,092 to £67,829.

In a statement accompanying the report and accounts Mr. J. Paterson says that since the close of the financial year considerable demand for the company's products has been experienced. The directors have under consideration various methods of increasing production and sales, and for this purpose, and also for the purpose of affording additional credit to buyers both at home and abroad, the directors are applying to H.M. Treasury for the advance of a further portion of the Treasury loan. To date £360,000 of the £500,000 Treasury loan has been taken, and the directors consider that the balance can now be usefully employed in the business.

**Broom & Wade, Ltd.**—It is proposed to issue a 100 per cent capital bonus, capitalizing £250,000 from the share premium account which, at 30th September, 1949, stood at £368,912. The authorized capital is to be increased from £400,000 to £1,000,000 by the creation of 2,400,000 5s shares, and the issue for cash of the remaining unissued part of the capital is under consideration.

**The Delhi Electric Supply & Traction Co., Ltd.,** whose undertaking was acquired by the Delhi Provincial Government, proposes to distribute 30s per £1 stock unit. The payment will be made as soon as practicable after the general meeting on 29th September.

**Associated Electrical Industries, Ltd.,** has declared an interim ordinary dividend of 5 per cent (unchanged).

**A. Reyrolle & Co., Ltd.,** have declared an interim dividend of 7½ per cent (unchanged).

**The London Electric & General Trust, Ltd.,** is to pay a final dividend of 5 per cent (against 4 per cent), making 7 per cent (6 per cent) for the year.

## LIQUIDATIONS

**G. R. Scott (Electrical), Ltd.**—Winding up voluntarily. Liquidator, Mr. A. J. R. Coward, of Coward, Button & Co., 317, High Holborn, London, W.C.1.

**Dawes Radio & Electric, Ltd.**—Meeting 16th October at 22, High Street, Dorchester, to receive an account of the winding-up by the liquidator, Mr. A. H. Edwards.

## BANKRUPTCIES

**J. Bannister,** carrying on business as an electrical contractor at 2, The Wiend, Wigan.—Trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester, 2, appointed 4th September.

**E. Cheetham,** 24, Windsor Drive, Audenshaw, nr. Manchester, electrician, formerly carrying on business at 377, Ashton Old Road, Manchester, as an electrical contractor.—Last day for receiving proofs for dividend 22nd September. Trustee, Mr. F. C. Ormrod, 20, Byrom Street, Manchester, Official Receiver.

**FINANCIAL SECTION**

# STOCKS and SHARES

THE possibility that a General Election might come about in the near future led to mild depression in the gilt-edged market and some of the purely investment departments of the Stock Exchange. Events of the current week were thought likely to exert a decided influence over the financial prospect, and, with the Government set upon nationalization of the steel industry, investment and speculation held back, pending whatever developments the immediate future might hold. After showing robust strength, the market for British Electricity, British Transport and other Government stocks, declined somewhat sharply from the recent best. Money, however, continues to seek the safety of the best class industrial shares, and the price movements on the week are mostly upward.

## Electrical Equipment Market

Grounds for confidence in the future of electrical engineering shares have long been so firm that the market found very slight occasion for responding to the Prime Minister's specific inclusion of the industry among those on which the main weight of the rearmament programme will fall. There was a marked reaction to the defence debate on the part of shares concerned with those of the other selected industries, which were previously beginning to see gaps ahead in their order books.

## C. A. Parsons' Dividends

The 7½ per cent interim dividend now declared by C. A. Parsons & Co. is equivalent to a consolidation of last year's payment of 5 per cent as dividend and a further 7½ per cent as a jubilee bonus. The final, declared last April, was 7½ per cent. It now seems proper to value the £1 ordinary shares on a 15 per cent dividend basis. The price has hardened to 70s, with very little stock available, and at that level the yield is £4 5s 9d per cent on the money. Earlier this year the company produced one of the outstanding reports for 1949, with trading profits up from less than half to over one million. These were the outcome of a two million pounds post-war re-equipment programme, and represented earnings of 137½ per cent on the nominal ordinary capital.

## Dividend Consideration

Associated Electrical Industries' maintenance of the interim dividend at 5 per cent serves to draw attention to the position of the select few industrials which stand, as do A.E.I. ordinary, on a yield basis of under 4 per cent from the last-paid dividends. Qualifications for that distinction cover, of course, all the attributes of a first-rate equity, including as a rule a dividend substantially less than present or probable future earning capacity, and grounds for expecting a better reward sooner or later. In the case of the A.E.I. for example, the 15 per cent dividend took but one-sixth of last year's available profit. Holders of shares in this class scanned last week's Parliamentary statements for clues to the outlook for company dividends, without finding anything definite to work on. Dividends and profits are coupled with wages in official exhortations for moderation, and developments on any one front will affect others.

## Week's Price Changes

Since a week ago, Mather & Platt have gained 3s 9d, to 40s, and amongst other rises of about 1s 3d to 1s 9d are Hoover 44s 3d, Metal Industries 42s 6d, Reyrolle 70s, Tube Investments 6¼, Enfield Cable 31s, British Aluminium 44s 3d. Babcock & Wilcox rose to 64s 3d; British Electric Traction deferred put on 30 points to 465. Murex 47s, Calcutta Trams 28s 6d, and Hackbridge Electric 14s, are all better. Advances occurred also in British Insulated Callender's, 32s 6d, British Vacuum, 12s 6d, Hall Telephone, 14s 6d, Watford, 7s, Cossor, 10s 6d, Newman Industries, 3s 6d, Decca, 14s 6d, and De la Rue, 23s 9d. Falls are negligible. Nigerian Electric, 28s 9d, are 9d down, and Anglo-American Telegraph preferred and deferred shed a point each to 93½ and 15 respectively.

## Vactric Report

After changing hands previously up to 10s, Vactric 5s shares were quoted at 8s 9d following the appearance of the annual report. This notifies shareholders of the company's intention to apply for a further advance from the Treasury loan granted two years ago. Of the £500,000 then granted, £360,000 has so far been borrowed. It is now considered that the balance can be usefully employed in the business. The news was taken by the market to end for good the speculation aroused last year, when the shares were run up to well over 20s by rumours of a sale to outside interests. Profit for the year, after tax, is confirmed as £71,000 against the previous loss of £91,000, and reduces the debit on that account to under £30,000.

# ELECTRICITY SUPPLY

## Generation in August
## Effects of Capital Expenditure Cut

A POINT of interest in the electricity statistics for August issued by the Ministry of Fuel and Power is the further increase in water power output as a result of the progress of the Scottish schemes. The total for the month of 72 million kWh compares with 62 million in August last year.

Of the overall increase in installed capacity of 64,000 kW during the month, 31,000 kW was added in the area of the British Electricity Authority and 33,000 kW in the North of Scotland. Details of newly commissioned B.E.A. plant are as follows: A 180,000 lb/hr John Thompson boiler at West Ham "B" power station; a 31,500 kW Richardsons Westgarth set and a 175,000 lb/hr International Combustion boiler at Leicester; and a 240,000 lb/hr Babcock & Wilcox boiler at Staythorpe.

The total quantity of electricity generated at stations controlled by the B.E.A., North of Scotland Hydro-Electric Board and Lochaber Power Co. in August was 3,742 million kWh, an increase of 8.5 per cent over the corresponding month last year. Further data relating to fuel consumption, etc., are set out in the accompanying table.

### *Power Plant Extensions*

The B.E.A. has received the consent of the Ministry of Fuel and Power to the development of the new Staythorpe power station to its full capacity and to an extension of the Huddersfield power station. The authorization covers the installation at Staythorpe of a 60,000 kW turbo-alternator and four 240,000 lb/hr boilers. When fully completed, this station will have a total installed capacity of 360,000 kW. The Huddersfield consent covers the installation of a 30,000 kW set and two 180,000 lb/hr boilers, as well as the construction of a cooling tower.

### *Height of Power Station*

The London County Council has consented to the erection of the Hackney generating station building to a greater height than prescribed by the London Building Act, 1930.

### *Southern Board's Capital Cut*

At last week's meeting of the Southern Electricity Consultative Council it was reported that the Southern Electricity Board had submitted a revised estimate of £5,156,000 as its capital expenditure requirements for 1950-51. The British Electricity Authority had decided, after an investigation of the needs of all the Electricity Boards, that only £4,512,000 could be allocated to the Southern Board. The Board had considered how this reduction could be made with the least possible disadvantage to the public. It was proposed to restrict, as far as possible, expenditure upon non-operational land and buildings, transport and system standardization and reinforcement of the system would be limited to the most urgent schemes. In new

| | Fuel consumed Thousand tons | | kWh generated Millions | | | kWh sent out Millions | Installed capacity (m.c.r.) MW |
|---|---|---|---|---|---|---|---|
| | Coal | Oil | Steam | Water Power | Total* | | |
| British Electricity Authority ... | 2,123 | 3.1 | 3,589 | 45 | 3,646 | 3,433 | 14,064 |
| North of Scotland ... ... ... | 14 | 1.1 | 20 | 72 | 96 | 95 | 413 |
| Total for August, 1950 ... ... | 2,137 | 4.2 | 3,609 | 117 | 3,742 | 3,528 | 14,477 |
| Total for August, 1949 ... ... | 2,025 | 3.2 | 3,372 | 62 | 3,449 | 3,243 | 13,428 |
| Increase, per cent ... ... ... | +5.5 | +31.3 | +7.0 | +88.7 | +8.5 | +8.8 | +7.8 |
| Total for year to date (8 months)... | 20,012 | 42.2 | 33,666 | 853 | 34,662 | 32,704 | — |
| Total for corresponding period of 1949 ... ... ... ... | 18,516 | 31.2 | 30,494 | 767 | 31,388 | 29,592 | — |
| Increase, per cent ... ... ... | +8.1 | +35.3 | +10.4 | +11.2 | +10.4 | +10.5 | — |

* The total figure includes generation by oil engines, refuse destructors and waste heat plants amounting to 6.3 million 0.1 million and 9.7 million kWh respectively in August.

development preference would be given to industrial consumers and certain classes of non-industrial development such as essential public services, new commercial and domestic premises, war-damaged houses which had been made habitable, farms and farm-workers' cottages, replacement of worn-out cooking and heating facilities in existing premises and cases in which hardship would otherwise exist or in which medical certificates justified a supply on grounds of health.

## *Malverns Scheme Rejected*

The Ministry of Fuel and Power has informed Malvern Hills Conservators' Board that, after considering the representations made at the public inquiry on 7th June, the Minister has withheld his consent to the proposal of the Midlands Electricity Board to erect an overhead line across the southern part of the Malvern Hills. The Minister would, however, be prepared to consider a revised application for placing the lines along an alternative route.

## *Concession to Scots Farmers*

A reduction in the charge for providing service to farms in the area of S.W. Scotland Electricity Board was announced in Glasgow on 7th September by the chairman, Mr. J. S. Pickles. In future, the maximum charge for leading in the main and providing a meter at any farmsteading will be £100, irrespective of the distance from an existing source of supply, and the charge will be reduced according to the size and type of the farm. Mr. Pickles said that in the past the charges paid by farmers had varied greatly, and it was a matter of policy that they should be evened out. The speed of the development would depend on the capital investment allowed by the Government and the supply position for cable and timber.

## *Consultative Councils Criticized*

Consultative councils in general and electricity in particular were criticized at a meeting of the Gloucestershire Executive of the National Farmers' Union on 16th September. Mr. E. G. Johnson said he had made representations against farcical waste of time and public money, but too many important people regarded it as a welcome day out from work. He had calculated that when expenses of members were paid, each meeting cost about £60. The secretary (Mr. D. G. B. Duff) said it was a case where farmers should be represented.

When Darlington Rural District Council considered a reply from the North Eastern Electricity Consultative Council to representations which it had made, the chairman of the R.D.C. (Mr. T. H. Summerson) said the letter should have been on the Electricity Board's stationery and not that of the Consultative Council. The Board recently asked for £400 to supply electricity to four houses and £67 for supplying a church. After referring to difficulties at present facing the Board, the letter from the Consultative Council stated that, with regard to the church, 286 yd of cable would be needed and the Board could not reduce the estimate. The Rural District Council decided to inquire whether the subject had, in fact, been before the Consultative Council.

## *Totnes Celebrations*

To mark the 1,000th year of its existence as a "burgh," Totnes recently held a united service during which the Mayor of Totnes switched on special floodlighting. The castle and other monuments were specially lit, all arrangements being made and the equipment lent by the South Western Electricity Board. The floodlighting will continue until September.

## *Load Spreading*

In a letter to local authorities and trade and commercial associations setting out the arrangements for spreading the load this winter, the Ministry of Fuel and Power says that all Electricity Boards expect to have difficulty in meeting the demands at peak hours. It is hoped that, apart from official restrictions, local authorities will arrange that decorative and flood lighting will not be used from 7 a.m. to 6 p.m. after 23rd October.

## *Yorkshire Winter Plans*

Details of the preparations being made by the Yorkshire Electricity Board to meet the winter load position were given to members of the Consultative Council last week. Mr. A. Haselhurst, commercial officer, explained that all domestic consumers and business premises were being placed on a rota for winter power cuts. Cards, suitable for hanging up in kitchens and offices, were being sent out showing when the consumers were likely to be affected by cuts. The rota would be a "moving" one, as cuts were more likely on some days than others. The cards would also remind consumers that outside the peak hours they could use as much electricity as they wished.

## *B.E.A. Collier*

Messrs. William Pickersgill and Sons, Ltd., Sunderland, have launched the collier *Sir Archibald Page* of 4,600 tons, the fourth of six ships ordered by the British Electricity Authority

# RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

## Colour-Matching Unit

A COLOUR-MATCHING unit recently placed on the market by IONLITE, LTD., 89, Scrubs Lane, London, N.W.10, has a light output of 5,500 lumens and contains two tungsten filament lamps and a special 105 W blue cold cathode fluorescent tube. Its light output is equal to natural daylight at a colour temperature of 6,500 deg K, which corresponds to north daylight. The unit weighs 55 lb, has a power factor of 0.85 and is available for operation on 50 c/s a.c. mains at voltages in the range 200-240 V.

## Iron Thermostat

Robustness, simplicity and long life of the contacts have been secured in the design of a thermostat which ROBERT MACLAREN & Co., LTD., Eglinton Works, Kilbirnie Street, Glasgow, C.5, have developed specially for domestic electric irons. The whole unit is mounted on a thick porcelain moulding and operation is by a bimetal strip on the base actuating a patent snap-action spring diaphragm. There is no interference with radio reception. The unit measures $3\frac{1}{8}$in by $1\frac{7}{16}$in by $1\frac{5}{32}$in high, excluding knob.

## Gauss Meter

A compact device for measuring flux densities up to 25,000 gauss, which has been introduced by the BRITISH THOMSON-HOUSTON Co., LTD., Rugby, enables measurements to be made in extremely small air gaps such as those encountered in instrument magnets and loudspeaker fields.

It employs the "Hall effect" in germanium and consists of a control unit which is approximately a 6in cube and a probe for placing in the magnetic field under test. The control unit incorporates a microammeter, calibration and zero adjusting rheostats, and a 4.5 V battery, making the equipment independent of all external power supplies. A five-way rotary switch on the front panel has "off" and "calibrate" positions and is also used for selecting ranges of 5,000, 10,000, or 25,000 gauss.

The probe (a sheath which houses the germanium "Hall" plate) measures only 0.140in by 0.035in and is 1.25in long as standard. This sheath is usually of non-magnetic metal, but can be of a non-metallic material and either type can, if necessary, be made longer than 1.25in for special applications.

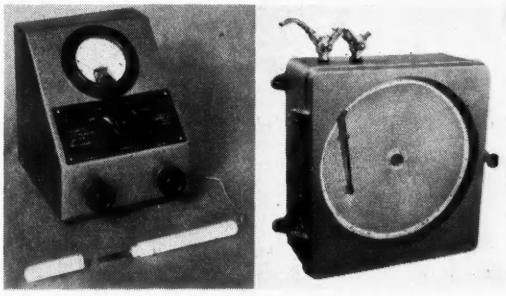
## Slow Break Switch

A 15 A slow break a.c. switch in a moulded housing has been added to the products of A. P. LUNDBERG & SONS, LTD., Rood End Road, Oldbury, Birmingham. Both single- and double-pole models are available with a "Bakelite" dolly for surface mounting or alternatively a brass dolly and bridge for flush mounting. It is interesting to note that the single-pole switch, although rated at 15 A, can comfortably be wired and fitted in a B.S. 1299 box.

## Recording Manometer

A compact instrument for the accurate recording of static differential pressures is introduced by FIELDEN (ELECTRONICS), LTD., Paston Road, Wythenshawe, Manchester. This "Manograph" works on the principle of capacity change and is available in three forms for recording differential pressures up to 8in Hg at low static pressures, up to 8in Hg at static pressures up to

**B.T.H. gauss meter, employing the "Hall effect" in germanium, and (Right) the Fielden recording manometer**

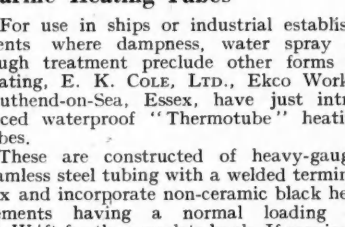


400 lb/sq in, and as low as 2mm Hg at low static pressures. The instrument is housed in a cast aluminium splash-proof case suitable for wall mounting and is operated from 230 V 50 c/s mains, the rating being 35 W. The necessary pressure pipes are connected to the "Manograph" by standard pipe connections and the instrument is fitted with isolating and equalizing valves.

## Marine Heating Tubes

For use in ships or industrial establishments where dampness, water spray or rough treatment preclude other forms of heating, E. K. COLE, LTD., Ekco Works, Southend-on-Sea, Essex, have just introduced waterproof "Thermotube" heating tubes.

These are constructed of heavy-gauge, seamless steel tubing with a welded terminal box and incorporate non-ceramic black heat elements having a normal loading of 180 W/ft for the complete bank. If required, this can be between 120 W/ft and 240 W/ft. The top coat finish of self oak colour cellulose protects the heater from rust and cor-



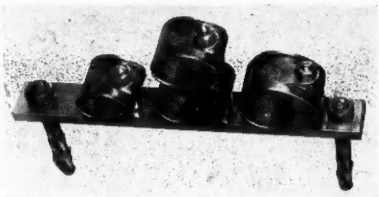
**Ekco marine and industrial heater**

rosion, the terminal box is drilled top and bottom for ½in conduit or packed gland and the cover has a watertight gasket. These heaters are available for operation on all normal mains voltages and can be supplied in lengths ranging from 3ft to 12ft.

## Cable Cleats

The claw-type cable cleats developed by BRITISH INSULATED CALLENDER'S CABLES, LTD., Norfolk House, Norfolk Street, London, W.C.2, provide a universal assembly which can be easily built up and modified on site to suit any arrangement or rearrangement of cables. The cleats are suitable for all cables sheathed with lead or aluminium (bare, served or armoured) and can be installed anywhere.

A comprehensive range of cleats, studs (for clamping) and wall bolts is available,



**Assembly of B.I.C.C. claw-type cable cleats**

each cleat being clearly marked with the range of cable diameters which can be accommodated. The different stud, bolt and cleat sizes have been selected to give maximum interchangeability and flexibility of erection, and full use can be made, therefore, of a minimum stock of spare parts.

All cleats consist of two identical halves, die-cast in a magnesium-free silicon-aluminium alloy. For cables up to 2in in diameter a single-bolt fixing is used, while a two-bolt fixing is employed for larger sizes. The design of an assembly is such that the cleat cannot rotate on the backstrap when the fixing bolt is tightened, and the two halves are dowelled together to ensure correct alignment. The backstraps are of galvanized mild steel and can be provided in a range of standard sizes to suit the number of ways and loadings required.

## Automatic Toaster

An attractively designed automatic "pop-up" toaster with the trade name "Toastmatic" has just been made available by ROEVAC METAL PRESSINGS, LTD., 329, Stretford Road, Hulme, Manchester, 15. It incorporates a pneumatic timing arrangement giving a control variable from zero to infinity although the toast can be ejected at any time irrespective of the control settings. Toasting both sides of two slices of bread at once, the appliance is rated at 1,200 W and can be supplied for all normal mains voltages. The finish is chromium with black moulded handles and control knob, the underneath being black enamel and the crumb remover door gold coloured.

**"Toastmatic" automatic toaster**

# NEW PATENTS

## Electrical Specifications Recently Published

*The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specifications (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.*

### 1945

2368. British Thomson-Houston Co., Ltd.—Electric motor control systems. 30th January, 1945. (644281.)

22485. Strong, H. P., and Eisler, P.—Production of patterns for use as conductors in electric circuits and apparatus. 30th August, 1946. (Cognate application, 13376, 2nd May, 1946.) (644565.)

26713. Watliff Co., Ltd., and Wilson, C. B.—Commutators. 14th October, 1946. (644285.)

31493. Submarine Signal Co.—High-frequency compressional-wave transmission and receiving systems. 22nd November, 1945. (644288.)

32492. British Thomson-Houston Co., Ltd.—Electric-discharge devices. 30th November, 945. (644852.)

### 1946

12610. British Thomson-Houston Co., Ltd.—Tap changing systems in electric induction apparatus. 26th April, 1946. (644289.)

18140. British Thomson-Houston Co., Ltd.—Microwave power measuring instruments. 17th June, 1946. (644290.)

18443. Philips Lamps, Ltd.—Arrangements comprising resiliently mounted, adjustable components. 19th June, 1946. (644567.)

26916. Marconi's Wireless Telegraph Co., Ltd.—Electron-discharge tube arrangements. 6th September, 1946. (Cognate application 26917, 29th May, 1941.) (644295.)

28141. British Thomson-Houston Co., Ltd.—Vibratory convertors. 19th September, 1946. (644296.)

32484. Standard Telephones & Cables, Ltd.—Telecommunication exchange system. 1st November, 1946. (644570.)

32708. Standard Telephones & Cables, Ltd.—Telecommunication exchange. 4th November, 1946. (644571.)

34692. Watliff Co., Ltd., and Wilson, C. B.—Commutators. 22nd November, 1946. (Divided out of 644285.) (644300.)

34737. Holt, Ltd., T., and Woods, C. W.—Electromagnetic torque convertor. 19th December, 1947. (644572.)

34893. Igranic Electric Co., Ltd.—Electric motor control systems. 25th November, 1946. (644573.)

35138. Serck Radiators, Ltd., Garner, E., and Montgomerie, G. A.—Air-cooling means for thermionic valves and like discharge tubes. 19th November, 1947. (644302.)

35508. Marconi's Wireless Telegraph Co., Ltd.—Navigation aiding radio systems. 29th November, 1946. (644303.)

36320. Sperry Gyroscope Co., Inc.—Electrical timing systems. 9th December, 1946. (644579.)

36839. Philips Lamps, Ltd.—Method of electric arc-welding under water. 13th December, 1946. (644304.)

17694. British Thomson-Houston Co., Ltd.—High-frequency electrical apparatus. 13th June, 1946. (644853.)

22826. General Electric Co., Ltd., and Thomas, E. R.—Thermionic valve circuits. 15th September, 1949. (644774.)

23244. Bart, S. G.—Apparatus for and method of electroplating the insides of pipes. 6th August, 1946. (644854.)

26013. Kesl, K.—Method of connecting and protecting appliances in domestic and industrial electrical installations. 29th August, 1946. (644857.)

33272. Standard Telephones & Cables, Ltd.—Finder systems for pulse channels. 8th November, 1946. (644860.)

33274. Standard Telephones & Cables., Ltd.—Telecommunication exchange. 8th November, 1946. (644861.)

33427. General Electric Co., Ltd., and Smyth, J. B. S.—Lighting fittings. 11th November, 1947. (644862.)

### 1947

231. Standard Telephones & Cables, Ltd.—Electron-discharge devices. 3rd January, 1947. (644308.)

2280. Standard Telephones & Cables, Ltd.—Electron beam tube. 24th January, 1947. (644583.)

2570. Pye, Ltd., and Weighton, D.—Blind approach or landing radio system for aircraft. 27th January, 1948. (644364.)

2625. Westinghouse Electric International Co.—Radar scanning apparatus. 28th January, 1947. (644365.)

3543. Philips Lamps, Ltd.—Radio navigational aid systems. 6th February, 1947. (Addition to 642094.) (644367.)

4344. Sylvania Electric Products, Inc. — Electron discharge tubes. 14th February, 1947. (644314.)

4347. Sylvania Electric Products, Inc.—Coating of articles electrophoretically. 14th February, 1947. (644368.)

6171. O'Dell, A. E. (Punch Engineering Pty., Ltd.—Telephone switching and signalling systems. 2nd April, 1948. (644316.)

6630. Philips Lamps, Ltd.—Glow-discharge tubes and the manufacture thereof. 10th March, 1947. (644369.)

11103. Leece-Neville Co.—Alternators for generating electricity. 25th April, 1947. (644586.)

11842. Leece-Neville Co.—Electrical supply systems for motor craft. 2nd May, 1947. (644587.)

12855. Lat Manufacturing Co., Ltd., and Lateulere, G. V.—Electric storage batteries. 12th June, 1948. (644380.)

14427. Laboratories Radioélectriques. — Frequency meter. 30th May, 1947. (644384.)

15129. Pierce Foundation, J. B.—Electrical conductor unit. 9th June, 1947. (Addition to 561728.) (644589.)

16309. British Thomson-Houston Co., Ltd.—Electric apparatus having an active part covered by a liquid insulation contained in a tank. 20th June, 1947. (644386.)

18233. British Thomson-Houston Co., Ltd.—Aircraft superchargers. 10th July, 1947. (644592.)

19331. British Thomson-Houston Co., Ltd.—Combined shut-off and metering valves. 10th July, 1947. (644324.)

18849. Radio Corporation of America.—Electrical compression system. 15th July, 1947. (644389.)

19171. British Thomson-Houston Co., Ltd.—Electric circuit interrupters for high-speed circuit-breakers of the liquid blast type. 17th July, 1947. (644392.)

21462. Sylvania Electric Products, Inc.—Fluorescent material. 6th August, 1947. (644599.)

21759. Western Electric Co., Inc.—Cavity resonators. 7th August, 1947. (644396.)

21923. Standard Telephones & Cables, Ltd.—Projection cathode-ray tubes. 8th August, 1947. (644327.)

23582. Machlett Laboratories, Inc. — X-ray apparatus. 26th August, 1947. (644602.)

23673. Philips Electrical, Ltd.—Multiple electric-discharge tubes. 27th August, 1947. (644603.)

23677. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. — Electron-ray tubes adapted for photographing electron images. 27th August, 1947. (644604.)

24651. Standard Telephones & Cables, Ltd.—Elec-

tron-discharge devices of the electron velocity modulation type. 8th September, 1947. (644606.)

25685. Pestarini, J. M. — Electric motors. 22nd September, 1947. (644607.)

26138. Standard Telephones & Cables, Ltd.—Pulse switching systems. 26th September, 1947. (644608.)

26292. Compagnie Générale de Télégraphie sans Fil. —Indirectly heated cathode for valves operating on decimetric waves. 29th September, 1947. (644610.)

26698. Bendix Aviation Corporation. — Electrical generator systems for effecting protection from excessive output voltage due to a fault in the generator or regulator. 3rd October, 1947. (Addition to 641671.) (644437.)

26822. Sharman, G. A.—Time delay apparatus for controlling an electric circuit. 26th October, 1948. (Cognate application 7762, 15th March, 1948.) (644438.)

29295. British Thomson-Houston Co., Ltd.—Methods of curing cement-type cold moulding compositions. 3rd November, 1947. (644615.)

31529. Westinghouse Electric International Co.— Alternating-current arc-welding systems. 28th November, 1947. (644617.)

31829. Telefonaktiebolaget L. M. Ericsson.—Regulators controlled by electron tubes. 2nd December, 1947. (644457.)

31858. Communications Patents, Ltd., and Schreuer, W.—Electronic valve amplifiers or oscillators. 31st December, 1948. (644402.)

32025. British Thomson-Houston Co., Ltd.—Control of direct-current generators. 12th December, 1947. (644619.)

33445. General Electric Co., Ltd., and Bryer, R. F. —Devices for controlling the speed of, and/or for smoothing, the movement of objects. 17th December, 1948. (644459.)

33639. Metropolitan-Vickers Electrical Co., Ltd., and Burrows, G.—Short path fractionating centrifugal stills. 14th December, 1948. (644621.)

33873. Kent, Ltd., G.—Electrostatic shields for pH electrodes. 22nd December, 1947. (644333.)

34400. Philips Electrical, Ltd.—Automatic frequency-correction circuit arrangements. 29th December, 1947. (644623.)

34567. Westinghouse Electric International Co.— Glow lamps. 30th December, 1947. (644462.)

34574. Soc. Anon. Vetreria Italiana Balzaretti Modigliani.—Tubular electrodes. 30th December, 1947. (644463.)

35141. Besset, M.—Electrical control devices for motor-vehicles traffic indicators. 31st December, 1947. (644625.)

35189. Philips Electrical, Ltd.—Ceramic insulators. 31st December 1947. (644626.)

29985. Standard Telephones & Cables, Ltd., Hough, G. H., and Jackson, T. M.—Time modulators for electric pulses. 5th November, 1948. (644925.)

30144. General Electric Co., Ltd., Smyth, J. B. S., and Burgess, C. W.—Lanterns for high-pressure metal vapour lamps. 26th October, 1948. (644889.)

30199. Standard Telephones & Cables, Ltd., and Hough, G. H.—Electric pulse generators. 12th November, 1948. (644926.)

31431. Philips Electrical, Ltd.—Pulse generators. 27th November, 1947. (644892.)

32123. English Electric Co., Ltd., and Wilson, G. R. —Control systems for dynamo-electric machines. 26th November, 1948. (644893.)

## 1948

1889. Southern Refrigerators & Catering Equipment, Ltd., and Childs, H. R.—Electric time switch mechanism. 21st January, 1949. (644495.)

3165. British Thomson-Houston Co., Ltd.—Electric lampholders. 3rd February, 1948. (644408.)

3287. British Thomson-Houston Co., Ltd.—Electric-discharge lamps. 4th February, 1948. (644409.)

3471. Cole, Ltd., E. K., and Burnard, C. L.—Gramophone pick-up devices. 5th February, 1949. (644499.)

4019. Philips Electrical, Ltd. — Electrical cavity resonators. 11th February, 1948. (644410.)

4258. General Electric Co., Ltd., Fairbairn, E. P., and mart, N. C. Radio transmission systems. 31st December, 1948. (644411.)

4837. Guardian Electric Manufacturing Co.—Solenoid construction. 18th February, 1948. (644502.)

5436. Blackband, W. T.—Methods and apparatus for coating electric conductors by extrusion. 24th March, 1949. (644477.)

5483. British Thomson-Houston Co., Ltd., Milner, C. J., and Wilkinson, K. J. R.—Magnetic induction acceleration of electrons. 22nd April, 1949. (Addition to 624850.) (644412.)

5834. General Electric Co., Ltd., and Sowter, A. B. —Dynamo-electric machines. 4th February, 1949. (644414.)

5953. Department of Commerce, Director of the Office of Technical Services of.—Electromechanical delay lines. 27th February, 1948. (644505.)

5982. Department of Commerce, Director of the Office of Technical Services of.—Electromechanical apparatus for the measurement of phase lag. 27th February, 1948. (644506.)

6204. Potter, D. M.—Releasable connector fittings for the ends of cables and rods. 27th February, 1948. (644508.)

6550. Philips Electrical, Ltd.—Multiplex pulse modulation radio receivers. 2nd March, 1948. (644415.)

7870. Westinghouse Electric International Co.— Landing approach light systems for airports. 16th March, 1948. (644512.)

9751. British Thomson-Houston Co., Ltd.—Ionization-type vacuum gauges. 7th April, 1948. (644418.)

10862. Newby, R. L. (Allmanna Svenska Elektriska Aktiebolaget). — Automatic electric arc welding machines. 20th April, 1948. (Convention date not granted.) (644480.)

11997. Svenska Turbinfabriks Aktiebolaget Ljungstrom.—Connecting device for elements of elastic-fluid machines. 1st May, 1948. (644481.)

12746. Kieft & Co., Ltd., C., and Jackson, H. E.— Snap-action electric switches. 28th April, 1949. (Cognate application 1031, 14th January, 1949.) (644520.)

13100. Ferranti, Ltd., and France, J. H.—Devices for feeding a continuous web or band of material. 12th May, 1949. (644523.)

14588. Milner, R. F. D.—Apparatus for use in the manufacture of electric cables. 31st May, 1948. (644530.)

14646. Standard Telephones & Cables, Ltd., and Sullivan, R. A. — Cable drums. 27th May, 1949. (644343.)

16915. Warren, E. M.—Electric safety switch. 23rd June, 1948. (644535.)

18411. Metropolitan-Vickers Electrical Co., Ltd., and McQueen, J. G. — Radar systems. 8th July, 1949. (644538.)

19109. Trix, Ltd., Prior, F. J., and Alton, W.— Blocks or carriers for electric terminals or sockets. 16th July, 1948. (644540.)

19209. General Cable Corporation.—Insulated electric power cables. 16th July, 1948. (644541.)

19757. British Thomson-Houston Co., Ltd., Welch, D. F., and Randall, K. B.—Circuit arrangements for charging condensers 7th July, 1949. (644347.)

20854. Maschinenfabrik Oerlikon.—Air-blast electric circuit-breakers. 6th August, 1948. (644489.)

21528. Lucas, Ltd., J., and Foxall, H. H.—Indicator lamps. 2nd August, 1949. (644544.)

22333. Miller & Co., Ltd., H., and Miller, M.— Dynamos for use in cycle lighting sets. 25th August, 1949. (644546.)

22419. British Thomson-Houston Co., Ltd., and Clarke, M. G.—Operating circuits for electric-discharge lamps. 25th July, 1949. (644547.)

24062. Robinson & Co., Ltd., F. R. Bleakley, J., and Robinson, H.—Electrically heated ovens. 31st December, 1949. (644552.)

2442. Standard Telephones & Cables, Ltd.—Electric multi-contact switch structures. 17th September, 1948. (644553.)

29607. English Electric Co., Ltd., and Hughes, J. O. P. — Flexible drives. 11th November, 1949. (644350.)

## 1949

13791. Lat Manufacturing Co., Ltd., and Lateulere, G. V.—Electric storage batteries. 12th June, 1948. (Divided out of 644380.) (644420.)

19634. Telegraph Condenser Co., Ltd., Sporing, P. A., and Bentley, N. H.—Electrolytic capacitors. 26th July, 1949. (644560.)

# CONTRACT INFORMATION

## Accepted Tenders and Prospective Electrical Work

## CONTRACTS OPEN

*Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.*

**Australia.**—QUEENSLAND.—12th October. City Electric Light Co., Ltd., Brisbane. One 4,000 kVA transformer. (C.R.E. (I.B.) 64268/50. Ten/1622.)* 26th October. Indoor metal-clad switchgear. (C.R.E. (I.B.) 64304/50. Ten/1620.)* 21st December. One 30,000 kW turbo-alternator and accessories for Bulimba "B" power station. (C.R.E. (I.B.) 63728/50.) Ten/1604.)*

4th October. State Electricity Commission. Radio communication system for Wide Bay Regional Electricity Board. (C.R.E. (I.B.) 63727/50. Ten/1603.)* 25th October. 22 kV air break switches and earth leakage protection equipment for substations. (C.R.E. (I.B.) 64903/50. Ten/1655.)* 29th November. Two 18,000 kW water-driven turbo-alternators. (C.R.E. (I.B.) 64303/50. Ten/1621.)* 13th December. Transformers for Tully Falls Hydro-Electric Scheme. (C.R.E. (I.B.) 64904/50. Ten/1653.)*

**Bath.**—City Education Committee. Electrical installation in Southdown Junior School. (See this issue.)

**Belfast.**—13th October. Electricity Department. Water screening plant. (See this issue.)

**Belgium.**—27th September. State Railways. Parts and accessories for overhead electric cables. (C.R.E. (I.B.) 64081/50. Ten/1623.)*

**Bournemouth.**—11th October. Corporation. Vehicle actuated traffic signals. (See this issue.)

**Hull.**—28th September. City Council. Reconditioning of electrical installation in connection with alterations to Manor House, North Ferriby. City architect, Guildhall.

**London.**—STEPNEY.—7th October. Borough Council. Electrical installations in 145 dwellings. (15th September issue.)

**New Zealand.**—14th November. State Hydro-Electric Department. 110 kV switchgear and steelwork for Kineith substation. (C.R.E. (I.B.) 64454/50. Ten/1631.)* 28th November. 50 kV outdoor switchgear and steelwork for Gisborne substation. (C.R.E. (I.B.) 64455/50. Ten/1632.)*

**Pakistan.**—2nd October. Department of Supply and Development. Copper wire and overground disconnecting boxes. (C.R.E. (I.B.) 64350/50. Ten/1649.)*

**South Africa.**—27th October. Bloemfontein Electricity Department. E.h.v. switchgear. (C.R.E. (I.B.) 64791/50. Ten/1641.)*

**Southern Rhodesia.**—3rd October. Department of Posts and Telegraphs. 30,000 dry cells (telephone). (C.R.E. (I.B.) 63887/50. Ten/1610.)*

**Southport.**—16th October. Lighting Department. Installation of Class "A" lighting in certain roads. (See this issue.)

**Tamworth.**—10th October. Borough Council. Wiring in welded screwed tubes of part of Tamworth Castle, including the provision of ironclad distribution and fuse boards, socket outlet switches and fittings. H. F. Bruce Smith, borough surveyor, Municipal Offices, Tamworth, Staffs.

**Uruguay.**—23rd October. Usinas Electricas y Telefonos del Estado. Underground armoured cable for 15,000 V and complementary material. (C.R.E. (I.B.) 64355/50. Ten/1639.)*

17th January. Equipment for the extension of the Jose Batlle y Ordonez central thermo-electric power station. (C.R.E. (I.B.) 60735/50. Ten/1625.)*

**Wortley.**—10th October. Trunk road lighting installation. (See this issue.)

## ORDERS PLACED

**Carlisle.**—Corporation. Electrical installation works at Lime House for Welfare Services Committee (£543).—Electrical Illuminating Co. Bed lift and food lift (£1,020).—Austin Lifts, Ltd.

**Dundee.**—Electric lighting, socket outlets, ventilation and power installation at Albert Institute (£6,584).—George Smith Engineers (Dundee), Ltd.

**Durham.**—County Education Committee. Electrical installation in kitchen and dining room at Hartlepool Hart Road County School (£763) and similar work at Hartlepool Henry Smith School (£651).—E. Dixon Barker and Son, Ltd., West Hartlepool.

**Hastings.**—Corporation. Electrical installation work at All Saints' Junior Mixed School (£131).—R. Westbrook & Co.

**Newcastle-on-Tyne.**—City Council. Electrical installation in ambulance garage, Sandyford Road, Newcastle-on-Tyne (£251).—T. Mitchelson (Electrical), Ltd., Gateshead.

Electric blowing plant for organ at St. Thomas' Church (£257).—Harrison and Harrison, Ltd., Durham.

Fluorescent street lighting fittings for Pilgrim Street (£1,597).—B.T.H. Co.

Sodium equipment for Great North Road (£930).—Metropolitan-Vickers.

Two five-ton petrol-electric mobile cranes for use on Newcastle Quay (£3,470).—Ransomes and Rapier, Ltd.

**Washington (Durham).**—U.D.C. Fittings for street lighting at Blue House Lane (£132).—G.E.C.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

## CONTRACTS IN PROSPECT

*Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.*

**Amlwch.**—New factory premises; Associated Ethyl Co., Ltd., Artillery House, Artillery Row, S.W.1.

**Arbroath.**—Houses (48), Cliffburn Road; W. R. Samson, housing architect, Olympia Buildings, Market Place.

**Bangor.**—Science block at University College of North Wales; W. T. Nicholls, Ltd., 6-8, St. Paul's Road, Gloucester.

**Birmingham.**—Secondary technical school for boys at Bourneville; Martin, Martin & Ward, architects, 106, Colmore Row, Birmingham.

**Bootle.**—Further 110 dwellings; borough engineer.

**Bournemouth.**—Residential school, Southbourne; Shaftesbury Society, 32, John Street, W.C.1.

Flats (40), Verney Road, for T.C.; John Laing & Son, Ltd., Bunns Lane, N.W.7.

**Chelmsford.**—Foundry extensions, King's Road; Christy & Norris, Ltd., Broomfield Road.

**Cheltenham.**—Reconstruction of the Playhouse; borough surveyor.

**Coventry.**—Two schools, Brookside Avenue and Parkgate Road, and Central College of Art and Technology, Civic Centre area; D. E. E. Gibson, city architect, 1a, Warwick Row.

**Crosby.**—Primary school; Henry Boot & Sons, Ltd., Aintree, Liverpool.

**Durham.**—Secondary grammar technical school at Spennymoor and workshop block for proposed technical college at Hebburn; county architect, Court Lane, Durham.

**Ellesmere.**—Primary school for Shropshire E.C.; Willink & Dod, architects, Cunard Building, Liverpool.

**Ely.**—School, Downham Road; R. D. Robson, county architect, County Hall, March.

**Erith.**—Flats (84), and six shops, Lesney Farm estate; borough surveyor, Council Offices.

**Glasgow.**—Houses (670), Milton; Scottish Housing Group, 21, Blythswood Square.

**Halifax.**—Flats (100), Grantham Road and Claremount Road; borough surveyor.

Secondary school; Middleton & Co. (Blackpool), Ltd., Banks St. Sidings, Blackpool.

**Heanor.**—Reconstruction of Church of All Saints at Marlpool; F. Sisson & Sons, Ltd., 32, Cromford Road, Langley Mill, Nottingham.

**Hendon.**—Works extension for Alfred Gilbert & Sons, Ltd., Edgware Road; Charles R. Price, Kingsbury Road, N.W.9.

Primary school, Barley Lane South; R. Duncan Scott, architect, 3, Bridge Street, Guildford.

**Kidbrook.**—Comprehensive high school (£639,735) for L.C.C.; Slater, Moberley and Uren & Pike, architects, 29, Gower Street, London, W.C.1.

**Langley.**—Causeway Green infants' school for Worcs. C.C.; Edgar Crowder, Ltd., Birmingham.

**Liverpool.**—Factory, Acornfield Road, Kirkby trading estate; Albright & Wilson, Ltd., Oldbury, Worcs.

Hostel for aged persons at Aigburth; city architect.

**London.**—Laboratory at Queen Mary College, Mile End, E.1 (£46,000); Wornum and Playne, architects, 19, Queen Anne's Gate, London, S.W.1.

Services club, Waterloo Road, S.E.1 (£40,000); R. M. Piggott, architect, 3, Cromwell Place, London, S.W.7.

Rebuilding wharf, etc., Victoria Docks, E.16 (£200,000); Tate and Lyle, Ltd., Fenchurch Street, E.C.3.

ISLINGTON.—Flats (102); E. C. P. Monson, architect, 120, Moorgate, E.C.2.

**Norwich.**—Works, Hall Road; Robert Stevenson, Ltd., Fishergate.

New north wing and assembly hall (£135,000) at City College and Art School; city architect.

**Onchan (I.O.M.).**—Houses (30), School Road, for Village Commissioners; Universal Housing Co., Ltd., Peel Road, Douglas.

**Orpington.**—Government office building; John Morgan (London), Ltd., 52, Grosvenor Gardens, S.W.1.

**Oxford.**—Accommodation for nurses, lecture room, etc., Girdlestone House, and conversion of workshops into ward unit, Wingfield-Morris Hospital; A. H. Barker & Partners, architects, 100, Victoria Street, Westminster, S.W.1.

**Plymouth.**—Business premises, corner of Old Town Street and New George Street, for Boots Pure Drug Co., Ltd.; firm's architect, Station Street, Nottingham.

Showrooms, etc. (£55,000); Harding and Sons, Ltd., house furnishers, Richmond Street.

**Portishead.**—Phosphorus factory, east of Docks area (£1,250,000); Albright and Wilson, Ltd., chemical manufacturers, Oldbury, near Birmingham.

**Salford.**—Extension of Royal Technical College (£75,000); county architect, County Offices, Preston.

New Savings Bank for Manchester & Salford Trustee Savings Bank at Broad Street; J. W. Beaumont & Son, Danlee Buildings, Spring Gardens, Manchester.

**Stratford-on-Avon.**—Interior reconstruction of Shakespeare Memorial Theatre (£50,000), for Board of Governors; Brian O'Rorke, architect, 12, Cliveden Place, London, S.W.1.

**Wallasey.**—Houses for B.C.; Wm. Thornton & Sons, Ltd., Liverpool (73 dwellings) and S. Burrows & Son, Hoylake Road, Moreton (14).

Scheme for shops, police buildings, ambulance and bus stations, Leasowe Common site, for Estates Committee; borough architect, 142-148, Brighton Street.

**Whickham (Co. Durham).**—Houses (72), Dunston No. 5 site, for U.D.C.; G.S.W. Urban Development, Ltd., builders, 38, The Side, Newcastle-on-Tyne.

**York.**—Extensions and adaptations at former military hospital, Fulford, Naburn, for Leeds Regional Hospital Board; F. Rowntree and Sons, architects, 120, The Mount, York.

Secondary school, Danesmead; city engineer and architect.